DEFENSE THREAT REDUCTION AGENCY

BROAD AGENCY ANNOUNCEMENT

HDTRA1-08-10-BRCWMD-BAA

Research and Development Enterprise

Basic and Applied Sciences Directorate

Basic Research for

Combating Weapons of Mass Destruction (C-WMD)

June 2008

Amendment 5 (September 2009)

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SECTION NO. **PAGE NO.**

OVERVIEW INFORMATION

1. Agency Name:

   Defense Threat Reduction Agency (DTRA)
   Research and Development (R&D) Enterprise
   Basic and Applied Sciences Directorate
   8725 John J. Kingman Road
   MS 6201
   Fort Belvoir, VA 22060-6201

2. Funding Opportunity Title:

   FY2009 – 2011 Basic Research for Combating Weapons of Mass Destruction (C-WMD)
   Broad Agency Announcement (BAA)

3. Announcement Type:

   This is an initial announcement of this funding opportunity. This BAA is in effect from June 2008 through October 2010 and will result in grants only. Over this timeframe there will be five (5) opportunities/periods to electronically submit research. Each period will have a two-phased submission process that begins with submission of a white paper that describes the proposed research. The white paper will be evaluated and the applicants may or may not be invited to submit a follow-on more detailed description of the research – the proposal. Phase I is associated with the white paper research submission, and open to all qualified grantees; Phase II is an invitation-only proposal submission resulting from Phase I as decided by the DTRA Source Selection.

4. Funding Opportunity Number:

   HDTRA1-08-10-BRCWMD-BAA

5. Catalog of Federal Domestic Assistance (CFDA) Number:

   12.351

6. Dates:

   Critical Phase I dates include online registration at the DTRA proposal submission website, and each of the Phase I white paper submission opportunities for each of the five (5) periods (Phase II and other important dates are in Section IV.3):

   All submissions will be made at the DTRA proposal submission website identified in Section VII.1 of the BAA.

Period	Date	Description
1	4 June 2008	Begin registration at the DTRA Proposal Submission Website
	14 July 2008	Phase I White Paper Submission Deadline
2	14 October 2008	Begin registration at the DTRA Proposal Submission Website
	24 November 2008	Phase I White Paper Submission Deadline
3	21 April 2009	Begin registration at the DTRA Proposal Submission Website
	1 June 2009	Phase I White Paper Submission Deadline
4	21 September 2009	Begin registration at the DTRA Proposal Submission Website
	2 November 2009	Phase I White Paper Submission Deadline
5	31 March 2010	Begin registration at the DTRA Proposal Submission Website
	12 May 2010	Phase I White Paper Submission Deadline

ADDITIONAL OVERVIEW CONTENT

Research proposals are sought from accredited degree-granting colleges and universities; and industrial/commercial/not-for-profit Basic Research Centers including small businesses with a portfolio predominantly in Basic Research offering a significant contribution by one (1) or more universities. A grant may be proposed for up to five (5) years. Awards are typically for a period of three (3) years with two (2) additional years possible as options. Awards average $100K to $500K per year, depending on the type of proposed effort submitted (e.g., single principal investigator (PI), young investigators, multiple investigator/multiple institutions/multidisciplinary).

This BAA is focused on soliciting basic research projects that support the DTRA mission to safeguard America and its allies from WMD (e.g., chemical, biological, radiological, nuclear, and high yield explosives) by providing capabilities to reduce, eliminate, and counter the threat and mitigate its effects. To this end, DTRA seeks research across broad strategic thrust areas:

1. ***Science of WMD Sensing and Recognition:*** The basic science of WMD sensing and recognition is the fundamental understanding of materials that demonstrate measurable changes when stimulated by energy, molecules, or particles from WMD in the environment. This research thrust involves exploration and exploitation of interactions between materials and various electromagnetic frequencies, molecules, nuclear radiation or particles. These interactions and the specific form of recognition they provide are used for subsequent generation of information that provides knowledge of the presence, identity, and/or quantity of material or energy in the environment that may be significant.
2. ***Cognitive and Information Science:*** The basic science of cognitive and information science is the convergence of computer, information, mathematical, networks, natural, and social science. This research thrust expands our understanding of social networks and advances knowledge of adversarial intent with respect to the acquisition, proliferation, and potential use of WMD. The methods may include analytical, computational or numerical, or experimental means to integrate knowledge across disciplines and improve rapid processing of intelligence and dissemination of information.
3. ***Science for Protection:*** Basic science for protection involves advancing knowledge to protect life and life-sustaining resources and networks. Protection includes threat containment, decontamination, threat filtering, and shielding of systems. The concept is generalized to include fundamental investigations that reduce consequences of WMD, assist in the restoration of life-sustaining functions, and support forensic science.
4. ***Science to Defeat WMD:*** Basic science to defeat WMD involves furthering the understanding of explosives, their detonation, and problems associated with accessing the target WMDs. This research thrust includes the creation of new energetic molecules/materials that enhance the defeat of WMDs, the improvement of modeling, and simulation of these materials and various phenomena that affect success and estimate the impact of defeat actions, and investigation of novel methods that may yield order-of-magnitude improvements in energy and energy release rate.
5. ***Science to Secure WMDs:*** Basic science to support securing WMD includes: (a) environmentally responsible innovative processes to neutralize chemical, biological, radiological, nuclear, or explosive (CBRNE) materials and components; (b) discovery of revolutionary means to secure components and weapons; and (c) studies of scientific principles that lead to novel physical or other tags and methods to monitor compliance and disrupt proliferation pathways. The identification of basic phenomena that provide verifiable controls on materials and systems also helps arms control.

The specific research opportunities composing these thrust areas are listed in Attachment 8. Please note that the research opportunities will likely be updated via an amendment to this BAA prior to each period.

I. FUNDING OPPORTUNITY DESCRIPTION

I.1. This BAA is an extramural endeavor that combines basic research needs of DTRA and the Joint Science and Technology Office for Chemical and Biological Defense's (JSTO-CBD) to address the full spectrum of counter-WMD challenges. Both DTRA and JSTO-CBD share the mission to safeguard America and its allies from WMD and provide capabilities to reduce, eliminate and counter the threat and effects from chemical, biological, radiological, nuclear, and high yield explosives. Each seeks to identify, adopt, and adapt emerging and revolutionary sciences that may demonstrate high payoff potential to counter-WMD threats.

I.2. This announcement solicits white papers for long-term challenges in specific fundamental areas of Basic Research that offer a significant contribution to the current body of knowledge or further the understanding of phenomena and observable facts and may have impact on future capabilities that support the DTRA and JSTO-CBD missions.

I.3. Basic Research is the systematic study directed toward greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications toward processes or products in mind. It includes all scientific study and experimentation directed toward increasing fundamental knowledge and understanding in those fields of the physical, engineering, environmental, and life sciences related to long-term national security needs. It is farsighted high payoff research that provides the basis for technological progress.

In contrast to Basic Research, Applied Research is the systematic study to understand the means to meet a recognized and specific need. It is a systematic expansion and application of knowledge to develop useful materials, devices, and systems or methods. The boundary between Basic Research and Applied Research occurs at the point when sufficient knowledge exists to support a hypothesis involving a specific application.

I.4. Responses to this BAA must address **only Basic Research**. White paper and proposal submissions that address Applied Research, Advanced Technology Development, or combine Basic Research with Applied Research and/or Advanced Technology Development will be considered unresponsive and will not be evaluated.

I.5. Attachment 8 presents the five (5) major functional counter WMD Research Thrusts with the Topic Areas for which white papers and proposals are sought.

I.5.1. The Topic Areas will likely change for each Period outlined in Section IV.3. Changes will be announced via an amendment to this BAA.

I.6. This BAA seeks optimum approaches to meet DTRA and JSTO Basic Research objectives. The Government encourages white papers and proposals that span a wide spectrum of research to expand fundamental scientific knowledge science in response to the specific Basic Research topics stated in Attachment 8 of this BAA. The Government reserves the right to award any combination of approaches which offer the best overall value to the Government, and to oversee any and all processes and approaches once ongoing.

I.7. This BAA, in addition to any amendments issued in conjunction with this BAA, will be

posted to the Grant Opportunities Website (www.grants.gov) and for informational purposes a notice will be posted on the Federal Business Opportunities Website (www.FedBizOpps.gov) and the DTRA website (www.dtra.mil).

II. AWARD INFORMATION

II.1. Award Types

II.1.1. Resulting awards from this announcement will be grants.

II.1.1.1. The Government actions under this BAA shall adhere to the requirements of the DoD Grant and Agreement Regulations (DoDGARS).

II.1.1.2. Subcontracting is permitted. Subcontracting plans are not required for grants.

II.1.2. Offerors are advised that Other Transactions are not applicable under this BAA.

II.2. DTRA intends to create an environment where potential offerors are willing to share findings of fundamental research with the Government. The Government will negotiate terms and conditions to leverage the successful offerors' advances. The Government seeks to ultimately acquire the fundamental research in addition to offering the appropriate level of protection of corporate and institutional intangible property rights, thus encouraging participation by a broad spectrum of leading-edge researchers. Please refer to DoDGARS Section II.2 for details of intangible property.

II.3. All coordination and communication between offerors and the Government will be conducted using the e-mail address associated with this BAA specified in Section VII.1.

II.4. The schedule of major milestones for this BAA is presented in Section IV.3.

II.5. Funding for participation in this program is highly competitive and the cost of proposed research should be strictly maintained in the award amounts outlined. Preference will be given to Single Investigator Awards and Young Investigator Awards.

II.6. Awards resulting from this BAA will be made based on the evaluation results of the two-phased proposal process described in Section IV.2.

II.7. The final number of projects and funds allocated will be determined after all proposals are received and evaluated.

II.8. The Government reserves the right to fund all, some, or none of the proposals submitted; may elect to fund only part of any or all proposals; and may incrementally fund any or all awards under this BAA. All awards are subject to the availability of funds.

II.9. While awards are anticipated to occur on or about the dates stated in Section IV.3, the Government may offer funding for any full proposals or portions of proposals at any time during

each fiscal year.

II.10. DTRA is seeking research projects with a POP of up to five (5) years that address topics in Attachment 8 of this BAA. Awards are typically for a period of three (3) years with two (2) additional years possible as options.

II.11. There are three (3) categories of award that will be considered:

1) Single Investigator Awards: Proposals that focus on exploratory aspects of a unique problem, a high risk approach, or innovative research in subjects with potential for high impact to C-WMD science. The predominance of awards will be Single Investigator Awards.

2) Single Grant/Multiple Investigator/Multidisciplinary Awards: Proposals that involve a comprehensive program of innovative research in either a focused or interdisciplinary area with potential for high impact. The proposed research must involve fundamental contributions in research by multiple investigators from diverse disciples (proposal must be multidisciplinary). Investigators may be from a single institution or different institutions up to three (3) institutions. Research must support multiple graduate students and be designed to leverage closer interaction and engagement with both university and government laboratory institutions. Authors of these white papers and proposals must take great care to clearly outline the impact to C-WMD science that is to be gained from the higher dollar amount investment and justify the scientific contribution from each investigator. Proposals submitted under this category must have a single lead organization and single lead business point of contact with the responsibility for registration and submission.

3) Young Investigator Awards: Proposals that focus on exploratory aspects of a unique problem, a high risk approach, or innovative research in subjects with potential for high impact to C-WMD science from non-tenured faculty who received a Ph.D. or equivalent degree on or after 15 May 2004.

II.12. The Government seeks to enable superior quality research resulting in peer reviewed scientific publications of significant merit. Offerors are strongly encouraged to publish the results or findings of their research in peer-reviewed journals.

III. ELIGIBILITY INFORMATION

III.1. Eligible Applicants.

III.1.1. Proposals submitted for this BAA will be considered from the following U.S. and Foreign Institutions as follows:

III.1.1.1. Accredited Degree-granting colleges and universities.

III.1.1.2. Industrial/commercial Basic Research Centers (Foreign based equivalents) including small businesses with a portfolio predominantly in Basic Research proposing a project with a significant contribution (minimum 30% of total effort value on the proposed project) by one or more universities.

III.1.1.3. Not-for-profit organizations/Basic Research Centers with a portfolio predominantly in Basic Research proposing a project with a significant contribution (minimum 30% of total effort value on the proposed project) by one or more universities. Proof of 501 (c) (3) status from the Internal Revenue Service may be required. For foreign based establishments, entirely based outside the United States and/or its territories, proof of not-for-profit status will have to be provided by the agency that provides that determination for that particular country.

III.1.2. The following entities may not participate as prime grantees nor furnish PI's in awards made under this BAA but may act as collaborators or subcontractors:

III.1.2.1. Federal (including DoD and Department of Energy (DOE)) laboratories, to include foreign equivalents.

III.1.2.2. U.S. Government agencies and organizations including Academic institutions that are federal government organizations (e.g., Naval Postgraduate School), to include foreign equivalents..

III.1.2.3. DoD sponsored Federally Funded Research and Development Centers (FFRDCs) specified in the Defense Federal Acquisition Regulation Supplement (DFARS) 235.017-1 (http://farsite.hill.af.mil/VFDFARA.HTM) and click on 'DFARS Part 35'.

III.1.2.4. DOE sponsored FFRDCs provided that authorization is obtained from the DOE sponsor.

III.1.2.5. Industrial/commercial firms.

III.1.3. All of the entities listed in Section III.1.2, except industrial/commercial firms, may respond to the annual 'Service Call' issued by the Basic Research and Applied Sciences Directorate, DTRA; see http://www.dtrasubmission.net and follow the link to the 'FY09-11 Basic Research for Combating Weapons of Mass Destruction (WMD) Service Call'. Please note that the Service Call link will also contain the submission period.

III.1.4. Proposals are encouraged from Historically Black Colleges and Universities (as determined by the Secretary of Education to meet requirements of Title III of the Higher Education Act of 1965, as amended (20 U.S.C. § 1061)) and from Minority Institutions defined as institutions "whose enrollment of a single minority or a combination of minorities…exceeds 50 percent of the total enrollment." [20 U.S.C. § 1067k(3) and 10 U.S.C. § 2323(a)(1)(C)].

III.2. Cost sharing or Matching. N/A.

III.3. Other.

III.3.1. Failure to register in accordance with instructions in Section IV.1 will render white papers and proposals ineligible for participation in this BAA.

III.3.2. Failure to meet the eligibility requirements outlined herein will render white papers and proposals ineligible for participation in this BAA.

III.3.3. Central Contractor Registration (CCR)

III.3.3.1. Prospective grantees must be registered in the DoD CCR database. By submission of an offer resulting from this BAA, the offeror acknowledges the requirement that a prospective grantee must be registered in the CCR database prior to award, during performance, and through final payment of any grant resulting from this BAA.

III.3.3.2. **IMPORTANT**: It is required that all offerors be registered in the CCR database at the time of Phase I proposal submission. CCR registration information must be included in Volume III, Supplemental Information, of the Phase II full proposal.

III.3.3.3. You may register with CCR by calling the CCR Assistance Center at 1-888-227-2423 or you may register online at http://www.ccr.gov. You will NOT be able to complete your CCR registration until CCR has confirmed your Employer Identification Number (EIN) or Taxpayer Identification Number (TIN) with the Internal Revenue Service (IRS).

III.3.3.4. Please note that it will take 24-48 hours for IRS to validate your TIN. According to the IRS, if you do not currently have an EIN and need to apply for one over the phone or Internet, you will be given a tentative EIN, but your EIN may not become active for up to two (2) weeks. If you have questions about your EIN, please call 1-800-829-4933.

III.3.3.5. If you have the necessary information ready, online registration will take about 30 minutes to complete, depending upon the size and complexity of your organization. If the organization completes the CCR registration process by 6:00 PM EST, the organizational representatives will be able to begin their registration process the very next business day.

III.3.4. Military Recruiting. This is to notify potential offerors that each grant awarded under this announcement to an institution of higher education, with exception of any grants awarded to institutions of higher education entirely located outside the United States and/or its territories, must include the following term and condition: "As a condition for receipt of funds available to DoD under this award, the recipient agrees that it is not an institution of higher education (as defined in 32 Code of Federal Regulations (CFR) Part 216) that has a policy of denying, and that it is not an institution of higher education that effectively prevents, the Secretary of Defense from obtaining the following for military recruiting purposes: (A) entry to campuses or access to students on campuses; or (B) access to directory information pertaining to students. If the recipient is determined, using procedures in 32 CFR Part 216 to be such an institution of higher education during the period of performance of this agreement, and therefore to be in breach of this clause, the Government will cease all payments of DoD funds under this agreement and all

other DoD grants and cooperative agreements, and it may suspend or terminate such grants and agreements unilaterally for material failure to comply with the terms and conditions of award." 32 CFR Part 216 may be accessed electronically at http://www.gpoaccess.gov/cfr/index.html. If your institution has been identified under the procedures established by the Secretary of Defense to implement Section 558 of Public Law 103-337, then: (1) no funds available to DoD may be provided to your institution through any grant, including any existing grant; and (2) your institution is not eligible to receive a grant in response to this BAA. This is to notify potential offerors that each grant awarded under this announcement to an institution of higher education, with exception of any grants awarded to institutions of higher education entirely located outside the United States and/or its territories, must include the following clause: DoDGARS Section 22.520, Military Recruiting and Reserve Officer Training Corps Program Access to Institutions of Higher Education.

IV. APPLICATION AND SUBMISSION INFORMATION

IV.1. Address to Request Application Package.

IV.1.1. Registration at the DTRA proposal submission website (https://www.dtrasubmission.net/) prior to submission of Phase I white papers is required.

IV.1.1.1. All offerors interested in submitting proposals must register on the DTRA proposal submission website beginning on or about the date stated in Section IV.3.

IV.1.1.2. Registration must be submitted by a central Business Point of Contact (BPOC) rather than individual PI personnel. A BPOC is a person who is given the responsibility of coordinating all submissions from individual PIs at his or her organization and will be the only individual who may access the DTRA proposal submission website. The intent is that all submissions from an organization be coordinated and submitted by a single, identified responsible party.

IV.1.1.3. Interested organizations must register at the DTRA proposal submission website even if previously registered at any other proposal submission site for prior DTRA and/or JSTO-CBD acquisition opportunities. Prior registration at any other proposal submission site does not fulfill registration requirements for participation in this BAA. Organizations who have already registered on the DTRA proposal submission website may use their current account to submit white papers and proposals for this solicitation.

IV.1.1.4. IMPORTANT: Registration at the DTRA proposal submission website is NOT the same as registering at the CCR website, FedBizOpps or Grants.gov websites. Failure to compliantly register at the DTRA proposal submission website specified in this BAA will prevent an offeror's submission of documents required for Phase I and thus render those documents ineligible for participation in this BAA.

IV.1.2. Using the DTRA proposal submission website, all Offerors must prepare proposal cover sheets (for both Phase I submissions and for invited Phase II submissions), including basic

identifying information for the institution, the points of contact, and certify that the offeror meets the eligibility requirements in Section III. Once the cover sheet is saved, the system will assign a unique proposal number for each Phase I submission and a different unique proposal number for each invited Phase II submission.

IV.1.2.1. Cover sheets may be edited until the submission period closes.

IV.1.2.2. For reference, a sample grant with DTRA terms and conditions is provided in Attachment 10. We recommend that all offerors examine the sample and encourage them to make themselves familiar with the standard DoDGARS clauses included. If selected for negotiation, offerors will be expected to be familiar with these clauses. Clauses may vary dependent upon the specifics of each individual project.

IV.1.3. White papers and proposals must be submitted electronically through the DTRA proposal submission website https://www.dtrasubmission.net/.

IV.1.4. Detailed registration and submission instructions are available at the site.

IV.1.5. Failure to register as stated will prevent an offeror's submission of documents required for Phase I and will render them ineligible for participation in this BAA. For each phase of submission, offerors will complete a cover sheet on the DTRA proposal submission website and certify that they meet the eligibility requirements in Section III. Phase I is for receipt of white papers. The second phase of this BAA is by invitation only. Invitation to the Phase II, full proposal submission (Volume I - Technical Proposal, Volume II - Cost Proposal and Volume III - Supplemental Information to include, but not limited to, a Statement of Work (SOW) and Quad Chart) will be based on the evaluation results in Phase I.

IV.2. Content and Form of Application Submission. This BAA will be conducted in two (2) phases as follows:

IV.2.1. Phase I – Interested offerors are required to complete a cover sheet using the DTRA Proposal submission website and must submit white papers in accordance with instructions provided in this section of the BAA and in accordance with the deadline stated in Section IV.3. Proposals will be evaluated against criteria as described in Section V.1. Based on this evaluation, selected offerors will be invited to submit full proposals for evaluation under Phase II.

IV.2.1.1. White Paper Submission and Content. Interested offerors are required to submit a four-page narrative (white paper). Each submission must contain a unique and descriptive white paper title, which is different from the topic title. Each submission must also specify the research area and topic addressed by identifying the specific topic number as presented in Attachment 8 of this BAA. See white paper format and narrative guidelines below.

IV.2.1.2. White Paper Narrative Format. The white paper must not exceed four pages, 8.5 x 11 inches, single-spaced, with one-inch margins in type not smaller than 12 point Times New Roman font. Any pages submitted that exceed the four-page limit will not be read or evaluated. The project title (which should be different than the topic title) must be included at the top of the page and must cite the topic number (refer to Attachment 8). The white paper narrative must specify a single topic area and issues for consideration by identifying at the end of the project title the specific paragraph referenced in Attachment 8. The white paper should provide sufficient information on the research being proposed (e.g., the hypothesis, theories, concepts, methodologies, data measurements, and analysis, etc.) to allow for an assessment by a technical expert. Do NOT include corporate or personnel qualifications, past experience, or any supplemental information. White papers that identify specific applications will be considered applied research and unresponsive to this BAA. See Section I.3 for more information on the difference between Basic and Applied Research.

IV.2.1.3. Classification: All white paper submissions must be UNCLASSIFIED. All information provided in the white paper that is marked appropriately will be considered proprietary information, as indicated in Section IV.5.4.

IV.2.1.4. Offerors invited to participate in Phase II must submit their full proposals in accordance with the instructions provided in Section IV.2.2 of this BAA. Full proposals will be evaluated against criteria as described in Section V.1 of this BAA. Submission procedures are detailed in this BAA and further detail may be given in the invitation. Any submission that does not conform to the requirements outlined in the BAA and in the invitation may not be reviewed or considered further. The due date for the Phase II proposals is stated in Section IV.3.

IV.2.2. Phase II - Full Proposal Submission and Content. The full proposal must be prepared in three separate volumes: Volume I – Technical Proposal; Volume II – Cost Proposal; and Volume III – Supplemental Information, to include an SOW and a Quad Chart.

IV.2.2.1. Volume I – Technical Proposal. The technical proposal must not exceed 20 pages (including references). If the proposal exceeds 20 pages, only the first 20 pages will be reviewed. A page is defined as 8 ½ x 11 inches, single-spaced, with one-inch margins in type not smaller than 12 point Times New Roman font. The technical proposal must include the components included in the template as shown in Attachment 4 of this BAA. Phase II technical proposals must be UNCLASSIFIED. All information provided that is marked appropriately will be considered proprietary information, as indicated in Section IV.5.4.

IV.2.2.2. Volume II – Cost Proposal. The cost volume should contain cost estimates sufficiently detailed for meaningful evaluation. Additionally, a cost summary must be prepared and submitted in conjunction with the detailed cost proposal. The cost summary is not to exceed two (2) pages, however the cost proposal does not have a page limit. The budget must include the total cost of the project, and the cost proposal must provide a breakdown of the amount(s) by task. The cost proposal must include the components included in the template as shown in Attachment 5 of this BAA. Separate cost proposals should be provided and incorporated into Volume II for any subcontracts or consultants.

IV.2.2.3. Volume III – Supplemental Information. This volume contains supplemental data. This volume must contain the items detailed in the table below. If any particular item is not relevant to the proposed effort, include a reference to the requested information and state that the particular information is not applicable in order to confirm a negative response.

	Item	**Required**
1.	Quad Chart	Yes
2.	Statement of Work	Yes
3.	Data Universal Number System (DUNS), Tax Identification Number (TIN) and North American Industry Classification System (NAICS)	Yes
4.	Certifications and Representations	Yes
5.	CCR	Yes
6.	Human Subjects	If Applicable
7.	Animal Use	If Applicable
8.	BioSurety and Select Agent Use	If Applicable
9.	Organizational Conflict of Interest Advisory	Yes
10.	Intangible Property Assertions	Yes
11.	Authorized Offeror Personnel	Yes
12.	Statement of Current and Pending Support	Yes
13.	Office of Naval Research (ONR)/ Defense Contract Audit Agency (DCAA)/ Defense Finance and Accounting Service (DFAS) Representatives	Yes
14.	Confirmed Proposal Expiration Date	Yes
15.	Supporting rationale of a portfolio predominantly in Basic Research (not required for Universities)	If Applicable

	Item	Required
16.	Supporting letter from the organization for the Young Investigator Awards stating the status of the PI as non-tenured faculty who received a Ph.D. or equivalent degree on or after 15 May 2004.	If Applicable

IV.2.2.3.1 Authorized Offeror Personnel. Offerors must include in the Phase II proposal the name, title, mailing address, telephone number, fax number, and e-mail address of the company and business point of contact regarding decisions made with respect to the offeror and who can obligate the proposal contractually. Also, identify those individuals authorized to negotiate with the Government. This information must be included in Volume III, Supplemental Information, of the Phase II full proposal.

IV.2.2.3.2 Statement of Current and Pending Support. Offerors must include in the Phase II proposal a statement of current and pending support of related work, and this information must be included for each investigator listed in the proposal. This statement requires that each investigator specify all grants and contracts through which he or she is currently receiving or may potentially receive financial support. This information must be included in Volume III, Supplemental Information, of the Phase II full proposal.

IV.2.2.3.3 ONR and DCAA Representatives (Administrative and Audit Offices). Offerors must indicate in the Phase II proposal which ONR and DCAA offices (or Cognizant Administrative and Audit Offices) will represent them. This information must be included in Volume III, Supplemental Information, of the Phase II full proposal.

- ONR: Offerors can identify their ONR office by going to the following website [http://www.onr.navy.mil/02/024/offices.asp] and look for the ONR office for their State.

- DCAA: Offerors can identify their DCAA office by going to the following website [http://apps.dtic.mil/wobin/WebObjects/DCAAzipcode] and entering their ZIP code.

IV.2.2.3.4 Confirmed Proposal Expiration Date. Offerors must provide written confirmation that holds the proposal, to include proposed costs, firm until award date as stated in Section IV.3. This information must be included in Volume III, Supplemental Information, of the Phase II full proposal.

IV.2.3. Offerors whose proposals are accepted for funding will be contacted before award to provide additional information required for award. This request for further information may include revised budgets or budget explanations and other information as applicable to the proposed award. Offerors who are not responsive to government requests for information in a timely manner, defined as meeting government deadlines established and communicated with the request, may be removed from award consideration.

IV.2.4. Each white paper and invited proposal will address one (1) Topic Area only.

IV.2.5. Each white paper and invited proposal will be reviewed within the Period to which it was submitted.

IV.2.6. Offerors may submit white paper and invited proposal to one (1) or more Topic Areas.

IV.2.7. Offerors may submit white paper and invited proposal to more than one (1) Period under this BAA.

IV.2.8. Proposals may be withdrawn by written notice received at any time before award. Withdrawals are effective upon receipt of notice by the Grant Officer via the e-mail address listed in Section VII.1.

IV.3. Submission Dates and Times. Milestones for awards made in fiscal years 2009-2011*.
*All dates are subject to change.

Date	Event
2 June 2008	BAA announced on Grants.gov and FedBizOpps websites
Period 1	
4 June 2008	Begin registration at the DTRA Proposal submission website
4 June 2008	DTRA Proposal submission website opens for receipt of White Paper
23 June 2008	Deadline to submit questions
30 June 2008	Questions and Answers posted at Grants.gov
2:00 PM EST, 14 July 2008	Phase I Proposal receipt deadline (White Paper)
On/about 25 August 2008	Phase II Proposals invited; non-selection notifications will follow approximately 2 weeks later
2:00 PM EST, 29 September 2008*	Phase II Proposal receipt deadline
On/about 24 November 2008	Topic L-Topic Q: Announcement of Apparent Successful Offerors; non-selection notifications will follow within 2

	weeks
On/about 12 December 2008	Topic A, B, D-H, and K: Announcement of Apparent Successful Offerors; non-selection notifications will follow within 2 weeks
On/about 2 February 2009	Topic C and I: Announcement of Apparent Successful Offerors; non-selection notifications will follow within 2 weeks
On/about 5 January 2009	Topic L-Topic Q: Estimated First Award Date
On/about 30 January 2009	Topic A, B, D-H, and K: Estimated First Award Date
On/about 15 March 2009	Topic C and I: Estimated First Award Date
Period 2	
14 October 2008	Begin registration at the DTRA Proposal submission website
15 October 2008	DTRA Proposal submission website opens for receipt of White Paper
3 November 2008	Deadline to submit questions
10 November 2008	Questions and Answers posted at Grants.gov
2:00 PM EST, 24 November 2008	Phase I Proposal receipt deadline (White Paper)
On/about 12 January 2008	Phase II Proposals invited; non-selection notifications will follow approximately 2 weeks later
2:00 PM EST, 17 February 2009*	Phase II Proposal receipt deadline
On/about 13 April 2009	Announcement of Apparent Successful Offerors; non-selection notifications will follow within 2 weeks
On/about 15 July 2009	Estimated First Award
Period 3	
On/about 21 April 2009	Begin registration at the DTRA Proposal submission website
1 May 2009	DTRA Proposal submission website opens for receipt of White Paper
18 May 2009	Deadline to submit questions
20 May 2009	Questions and Answers posted at Grants.gov
2:00 PM EST, 1 June 2009	Phase I Proposal receipt deadline (White Paper)
On/about 14 July 2009	Phase II Proposals invited; non-selection notifications will

	follow approximately 2 weeks later
2:00 PM EST, 18 August 2009*	Phase II Proposal receipt deadline
On/about 14 October 2009	Announcement of Apparent Successful Offerors; non-selection notifications will follow within 2 weeks
On/about 14 December 2009	Estimated First Award Date
Period 4	
21 September 2009	Begin registration at the DTRA Proposal submission website
23 September 2009	DTRA Proposal submission website opens for receipt of White Paper
19 October 2009	Deadline to submit questions
26 October 2009	Questions and Answers posted at Grants.gov
2:00 PM EST, 2 November 2009	Phase I Proposal receipt deadline (White Paper)
On/about 12 January 2010	Phase II Proposals invited; non-selection notifications will follow approximately 2 weeks later
2 PM EST, 24 February 2010*	Phase II Proposal receipt deadline
On/about 17 April 2010	Announcement of Apparent Successful Offerors; non-selection notifications will follow within 2 weeks
On/about 27 October 2010	Estimated First Award Date
Period 5	
31 March 2010	Begin registration at the DTRA Proposal submission website
2 April 2010	DTRA Proposal submission website opens for receipt of White Paper
26 April 2010	Deadline to submit questions
3 May 2010	Questions and Answers posted at Grants.gov
2:00 PM EST, 12 May 2010	Phase I Proposal receipt deadline (White Paper)
On/about 23 June 2010	Phase II Proposals invited; non-selection notifications will follow approximately 2 weeks later
2:00 PM EST, 28 July 2010*	Phase II Proposal receipt deadline

On/about 22 September 2010	Announcement of Apparent Successful Offerors; non-selection notifications will follow within 2 weeks
On/about 13 January 2011	Estimated First Award Date

* Due dates detailed in the letter of invitation supersede this due date; invitation letters will not have a due date prior to the date listed in this announcement.

IV.3.1. Late Submissions.

IV.3.1.1. Offerors are responsible for access to the DTRA proposal submission website and for submitting electronic proposals so as to be received at the Government office designated in this BAA no later than the time and dates stated in Section IV.3. Please note that according to 15 US Code 260a, daylight savings time becomes the standard time during the daylight savings period. When sending electronic files, the offeror will account for potential delays in file transfer from the originator's computer server to the Government website/computer server. Offerors are encouraged to submit their Proposals early to avoid potential file transfer delays due to high demand encountered as the submission deadline approaches.

IV.3.1.2. If the proposal is received at the Government office designated in this BAA after the exact time and date specified for receipt of offers, it is "late" and will not be considered. This applies for both Phase I and Phase II submissions.

IV.3.1.3. Acceptable evidence to establish the time of receipt at the Government office includes documentary and electronic evidence of receipt maintained by the installation. Offerors should also print, and maintain for their records, the electronic receipt that appears on the screen following submission of a proposal on the DTRA proposal submission website.

IV.3.1.4. If an emergency or unanticipated event interrupts normal Government processes so that proposals cannot be received at the office designated for receipt of proposals by the exact time specified in the BAA, and urgent Government requirements preclude amendment of the BAA closing date, the time specified for receipt of proposals will be deemed to be extended to the same time of day specified in the BAA on the first work day on which normal Government processes resume.

IV.3.1.5. The Government may reject Phase I or Phase II submissions that are deemed non-compliant, i.e., that deviate from the instructions in the BAA.

IV.4. Funding Restrictions. Indirect costs must be less than 35% of the total grant value per the 2008 DoD Appropriations Act (Public Law 110-116, Section 8115) and the 2008 and 2009 DoD Appropriations Act (Public Law 110-329, Section 8109). This restriction currently applies to awards made using fiscal year (FY) 2008 and 2009 Basic Research funds and may apply to future awards.

IV.5. Other Submission Requirements.

IV.5.1. Offerors shall plan and budget for travel to accommodate the three meetings outlined below.

IV.5.1.1. National Conferences/Workshops/Symposia: Offerors are strongly encouraged to attend a nationally recognized conference, workshop, or symposium in the field of research each calendar year (one (1) at minimum). Research should be presented as soon as adequate data are available to support posters and presentations. Conferences/workshops/symposia should be attended by the PI and students supporting the research, as appropriate.

IV.5.1.2. Annual Technical Review: Offerors shall plan to attend an annual technical program review meeting. For planning purposes the review will be for five (5) days and may be held in a different region of the United States each year. DTRA encourages graduate students to attend the Annual Technical Review.

IV.5.1.3. Basic Research Scientific Exchange: Offerors shall plan annual attendance by the PI(s) and students supporting the research effort each calendar year at the Basic Research Scientific Exchange to be held at DTRA (Ft. Belvoir, VA). The Scientific Exchange will be three (3) days in length and will begin summer of 2010. Offerors should plan on a per person fee of $500.00 to cover the cost of continental breakfast, box lunch, and an evening reception. The intent of the Scientific Exchange is to familiarize the performers in the Basic Research Program with DTRA to include tours, presentations from across DTRA, and presentations from other performers in the program.

IV.5.2. Submission Address

IV.5.2.1. Offerors must submit their proposal through the DTRA proposal submission website (https://www.dtrasubmission.net/). In the future, offerors may submit through the Grants.Gov APPLY website: http://www.grants.gov/applicants/apply_for_grants.jsp. Attachment 9 provides offerors with an overview of the Grants.Gov APPLY process as a reference.

IV.5.2.2. Proposals submitted by any means other than the DTRA proposal submission website (e.g., hand-carried, postal service, commercial carrier, and e-mail) will not be considered. Offerors are responsible for ensuring compliant and final submission of their proposals and can verify the submission of the proposal package with the electronic receipt that appears on the screen following submission of a proposal to the DTRA proposal submission website.

IV.5.3. Submission File Format. Perform a virus check before uploading any files. If a virus is detected, it may cause rejection of the file. Do not lock or encrypt any files you upload. The white paper and proposal must be uploaded as a Portable Document File (PDF) format compatible with Adobe Acrobat® version 7.0 or earlier. The white paper must be provided in portrait layout; each file will not exceed 2 Megabytes of storage space. For proposals each individual file will not exceed 5 Megabytes of storage space. Movie and sound file

attachments, or other additional files, will not be accepted. If multiple white papers and proposals are being submitted by the same institution, separate cover sheets must be generated for each, since a unique document number will automatically be assigned to each submission by the electronic proposal tracking system. All documents submitted to the DTRA proposal submission website are considered works in progress and are not eligible for evaluation until the offeror submits the final white paper or proposal package for consideration. The final submission must be 'locked' on the DTRA proposal submission website; until a submission has been 'locked' (saved as final), the submission is not eligible for review. Look for this 'lock' icon  on the DTRA proposal submission website. Offerors are responsible for ensuring compliant and final submission of their proposals, and can verify the submission of the proposal package with the electronic receipt that appears on the screen following submission of a proposal to the DTRA proposal submission website.

IV.5.4. Marking of White Paper and Proposal and Disclosure of Proprietary Information other than to the Government.

IV.5.4.1. The Quad Chart portion of the submission will not contain information deemed trade secret, confidential or proprietary by the offeror.

IV.5.4.2. The white paper/proposal submitted in response to this BAA may contain technical and other data that the offeror does not want disclosed to the public or used by the Government for any purpose other than proposal evaluation. Public release of information in any white paper/proposal submitted will be subject to existing statutory and regulatory requirements. If proprietary information which constitutes a trade secret, proprietary commercial or financial information, confidential personal information, or data affecting the national security, is provided by an offeror in a white paper/proposal, it will be treated in confidence, to the extent permitted by law, provided that the following legend appears and is completed on the front of the white paper/proposal: "For any purpose other than to evaluate the white paper/proposal, this data shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed in whole or in part, provided that if an award is made to the offeror as a result of or in connection with the submission of this data, the Government shall have the right to duplicate, use or disclose the data to the extent provided in the agreement. This restriction does not limit the right of the Government to use information contained in the data if it is obtained from another source without restriction. The data subject to this restriction is contained in page(s) _____ of this White Paper/Proposal." Any other legend may be unacceptable to the Government and may constitute grounds for removing the Proposal from further consideration without assuming any liability for inadvertent disclosure. The Government will limit dissemination of properly marked information to within official channels. In addition, the pages indicated as restricted must be marked with the following legend: "Use or disclosure of the white paper/proposal data on lines specifically identified by asterisk (*) are subject to the restriction on the front page of this white paper/proposal." The Government assumes no liability for disclosure or use of unmarked data and may use or disclose such data for any purpose.

IV.5.4.3. In the event that properly marked data contained in a white paper/proposal submitted in response to this BAA is requested pursuant to the Freedom of Information Act (FOIA), 5 U.S.C. § 552, the offeror will be advised of such request and, prior to such release of information, will be requested to expeditiously submit to DTRA a detailed listing of all information in the white paper/proposal which the offeror believes to be exempt from disclosure under the Act. Such action and cooperation on the part of the offeror will ensure that any information released by DTRA pursuant to the Act is properly identified.

IV.5.4.4. By submission of a white paper/proposal, the offeror understands that proprietary information may be disclosed outside the Government for the sole purpose of technical evaluation. The Grants Office will obtain a written agreement from the evaluator that proprietary information in the white paper/proposal will only be used for evaluation purposes and will not be further disclosed or utilized.

V. APPLICATION REVIEW INFORMATION

V.1. Criteria: The three (3) evaluation criteria to be used are listed in Sections V.1.1-V.1.3.

V.1.1. Technical/Scientific Merit. This area addresses the technical approach and the contribution of the research to advancing the C-WMD scientific body of knowledge. It evaluates what research will be performed, and how it will be accomplished. Three factors will be considered. The first factor (Soundness of Approach) is of highest importance. The other two factors are of lesser but equal importance.

V.1.1.1. *Soundness of Approach*. This factor addresses whether the Proposal writer clearly identifies and demonstrates an understanding of the C-WMD scientific challenges and whether the project has a well-designed methodology, based on sound scientific principles, to address the stated C-WMD scientific challenge, and how technical risks are addressed, mitigated, and managed.

V.1.1.2. *Degree of Innovation*. This factor addresses the originality of the concept, its scientific merit, its creativity, and/or the novelty of the approach and the potential of the project to advance the C-WMD scientific body of knowledge. The degree of innovation will be judged based on the innovation or originality that is appropriate to the proposed project.

V.1.1.3. *Anticipated Scientific Impact.* This factor addresses the potential of the proposed work to provide greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts and the anticipated impact on the state of the C-WMD science.

V.1.2. Responsiveness to Topic Area and Program. This area evaluates the extent to which the proposed research supports specific topic areas. It also considers the derivative benefit that may be realized by the performer and its organization through performance of the proposed research. Two factors will be considered: 1) Responsiveness to Topic Area; and 2) Derivative Benefit.

The first factor is of higher importance.

V.1.2.1. *Responsiveness to Topic Area*. This factor addresses the responsiveness of the proposal to the objectives in the specific topic area and the contribution to the C-WMD science needs outlined in the proposal.

V.1.2.2. *Derivative Benefit.* This factor considers the impact of plans to enhance the institution's ability to perform defense-relevant research and to train, through the proposed research, students in science and/or engineering (for example, by acquiring or refurbishing equipment that can support DoD research and research-related educational objectives).

V.1.3. Program Capabilities and Cost. This area addresses key personnel, facilities, and major equipment required to accomplish the research. The first two factors (Qualifications and Capabilities) are of highest importance and weighted equal to each other. The cost factor is of lesser importance.

V.1.3.1. *Qualifications*. This factor will be scored based on the qualifications, and availability of the proposed PI, co-PIs and other key personnel who are critical in achieving proposed objectives.

V.1.3.2. *Capabilities*. This factor considers the offeror's current or planned facilities and equipment that support achieving the proposed objectives. Capabilities evaluation will be based on the total capabilities of the assembled team that will be brought to bear as part of the proposed project.

V.1.3.3. *Cost Realism and Reasonableness*. This factor considers the adequacy and reasonableness of resources applied to each project task. This includes labor (in terms of time and mix), equipment, other direct costs, fee (if applicable), and indirect costs.

V.2. Review and Selection Process

V.2.1. The white paper and proposal selection process will be conducted based upon a technical review as described in the DoDGARS [(DoD 3210.6-R, Section 22.315)] and includes the use of non-government peer-reviewers.

V.2.2. White Paper (Phase I) Evaluation

V.2.2.1. The evaluation will be based on two equally weighted criteria described in Section V.1: 1) Technical/Scientific Merit and 2) Responsiveness to Topic Area and Program.

V.2.2.2. These will be scored as Green (acceptable), Yellow (acceptable with minor issues), or Red (unacceptable).

V.2.2.3. The Government does reserve the right to limit the number of Phase II proposals requested depending upon the volume of proposals submitted, the results of the Phase I evaluation, and the specific needs of the Agency.

V.2.3. Full Proposal (Phase II) Evaluation

V.2.3.1. The evaluation will be based on the three equally weighted criteria described in Section V.1: 1) Technical/Scientific Merit, 2) Responsiveness to Topic Area and Program, and 3) Program Capabilities and Cost.

V.2.3.2. All three criteria receive a numerical score ranging from 1 (unacceptable) to 5 (outstanding).

V.2.3.3. Proposals will be accepted based on the reviews, availability of funds, consideration of possible duplication with other research, program balance across research topics, and the specific needs of the Agency.

V.2.4. All documents necessary for the review and evaluation of the Phase I and Phase II submissions must be provided as described in Section IV.2 of this BAA.

V.2.5. Other factors that may be considered during the selection process are the possible duplication with other research currently funded by the Government, program balance across research topics, and budget limitations. Accordingly, proposals may be selected for funding which are not reviewed as highly as others, which are of higher risk and/or which may be of a higher cost.

V.2.6. The Government reserves the right to select all, some, or none of the proposals, or any part of any proposal, received in response to this BAA and to make awards without discussions with offerors; however, the Government reserves the right to conduct discussions if determined necessary.

V.2.7. Technical and Administrative Support by Non-Government Personnel

V.2.7.1. It is the intent of DTRA to use non-government personnel (e.g. peer-reviewers and contractor support personnel) to assist with the review and administration of submittals for this BAA; and, in some instances, and where they are Subject Matter Experts and meet all the criteria for a peer reviewer, non-government personnel will serve as reviewers.

V.2.7.2. Participation in this BAA requires existing DTRA support contractors including Northrop Grumman and their subcontractors, Tauri and their subcontractors, Suntiva Executive Consulting, and BRTRC Inc. employees to have access to proposal information including information that may be considered proprietary.

V.2.7.3. All individuals in this category having access to any proprietary data must certify that they will not disclose any information pertaining to this BAA including any submittal, the identity of any submitters, or any other information relative to this BAA.

V.2.7.4. This BAA includes requirements for non-disclosure of offeror proprietary information. Additionally, Northrop Grumman Information Technology and Tauri employees in their role as an Advisory and Assistance Services contractor to DTRA will provide technical input in an advisory role, as Subject Matter Experts, to the Government reviewers in addition to providing administrative support in the management of the white papers, proposals and the technical review.

V.2.7.5. All offerors to this BAA consent to the disclosure of their information to the assigned peer-reviewers, Northrop Grumman and their subcontractors, Suntiva Executive Consulting, BRTRC, Inc., and Tauri employees under these conditions.

VI. AWARD & NOTIFICATION ADMINISTRATION INFORMATION

VI.1. Award Notices.

VI.1.1. Offerors of white papers that are not selected for invitation will be notified by e-mail at the addresses provided at the time of submission of the decision according to the schedule in Section IV.3.

VI.1.2. An invitation to submit a full proposal will be extended to those offerors whose submissions were selected in Phase I. The invitation will be transmitted via e-mail to the offeror's registered BPOC in accordance with the deadline stated in Section IV.3. Additionally, it is the responsibility of the BPOC to inform the PI of the invitation to prepare a Phase II submission.

VI.1.3. Offerors will be notified by DTRA of their selection/non-selection of award decisions from the Phase II proposals via the DTRA proposal submission website. Notification of acceptance and intent to negotiate is not an authorization to begin performance.

VI.1.4. Debriefings will be posted to the DTRA proposal submission website and/or included in the notification emails. Directions for accessing the debriefing will be provided in the notification e-mail. Debriefings will be available by the award date that correlates to the submission period as detailed in Section IV.3.

VI.1.5. The offerors must be aware that it is their responsibility to ensure that this e-mail notification reaches the intended recipient and is not blocked by the use of 'spam blocker' software or other means that the recipient's Internet Service Provider may have implemented as a means to block the receipt of certain e-mail messages. If for any reason there is a delivery failure of these e-mail notices, DTRA will not further attempt to contact the offerors. If a notification is not received by the institution according to the deadlines stated in Section IV.3, it is the responsibility of the offeror institution to check the website for an update and/or contact DTRA via Agency Contacts according to Section VI.

VI.2. Administrative and National Policy Requirements.

VI.2.1. Protection of Human Subjects

VI.2.1.1. It is not anticipated that human subjects would be involved in Basic Research. If the proposed research does involve human subjects or materials, however, offerors are asked to justify the use of human subjects and to address the following issues: outline the human use, to include the source of the human subjects or materials involved in the research. This information, if applicable, must be included in Volume III, Supplemental Information, of the Phase II full proposal. Further information may be required if the proposal is successful.

VI.2.1.2. All research under any award made under this BAA involving human subjects must be conducted in accordance with 32 CFR 219, 10 U.S.C. § 980, and DoD Directive 3216.2, and, as applicable, 21 CFR parts 11, 50, 56, GCP, the ICH as well as other applicable federal and state regulations. Grantees and their subcontractors must be cognizant of and abide by the additional restrictions and limitations imposed on the DoD regarding research involving human subjects, specifically as regards vulnerable populations (32 CFR 219 modifications to subparts B-D of 45 CFR 46), recruitment of military research subjects (32 CFR 219), and surrogate consent (10 U.S.C. § 980). For grants awarded to foreign institutions, you must follow either local or US laws (as stated above) depending on which laws provide stronger protection.

VI.2.1.3. DTRA Directive 3216.01 of January 28, 2005 establishes the DTRA Human Subjects Protection Program, sets forth the policies, defines the applicable terms, and delineates the procedures necessary to ensure DTRA compliance with federal and DoD regulations and legislation governing human subject research. The regulations mandate that all DoD activities, components, and agencies protect the rights and welfare of human subjects of study in DoD supported research, development, test and evaluation, and related activities hereafter referred to as "research." The requirement to comply with the regulations applies to new starts and to continuing research. For grants awarded to foreign institutions, you must follow either local or US laws (as stated above) depending on which laws provide stronger protection.

VI.2.1.4. The DTRA Directive requires that research using human subjects may not begin or continue until the DTRA Human Research Oversight Board (HROB) has reviewed and approved the proposed protocol. Grantees and subcontractors are required to submit a valid federal assurance for their organization (institution, laboratory, facility) that has been issued by either DoD or the Department of Health and Human Services, for foreign institutions the equivalent for these agencies and documentation of review of proposed protocols by the local Institutional Review Board (IRB) to include consent forms for any planned research using human subjects to the DTRA HROB for its review through the grant officer's representative (if assigned) or the grants officer. The HROB review is separate from, and in addition to, local IRB review.

VI.2.1.5. A study is considered to involve human research subjects if: 1) there is interaction with the subject (even simply talking to the subject qualifies; no needles are required); and 2) if the study involves collection and/or analysis of personal/private information about an individual, or if material used in the study contains links to such information. In the case of foreign institutions, this is just a minimum definition, if local laws and/or regulations have a stronger definition you must then follow that definition.

VI.2.1.6. Written approval to begin research or to subcontract for the use of human subjects under the proposed protocol will be provided in writing from the DTRA HROB, through the grant officer. Both the grantee and the Government must maintain a copy of this approval. Any proposed modifications or amendments to the approved protocol or consent forms must be submitted to the local IRB and the DTRA HROB for review and approval. Examples of modifications/amendments to the protocol include, but are not limited to:

- a change of the PI;
- changes in duration or intensity of exposure to some stimulus or agent; changes in the information requested of volunteers, or changes to the use of specimens or data collected; or
- changes in perceived or measured risks or benefits to volunteers that require changes to the study.

VI.2.1.7. Research pursuant to such modifications or amendments must not be initiated without IRB and HROB approval except when necessary to eliminate apparent and immediate hazards to the subject(s).

VI.2.1.8. Research projects lasting more than one year require IRB review at least annually, or more frequently as required by the responsible IRB (local rules and laws for foreign institutions). HROB review and approval is required annually. The grantee or subcontractor must provide documentation of continued IRB review of protocols for HROB review and approval in accordance with the Grant Data Requirements List. Research must not continue without renewed HROB approval unless necessary to eliminate apparent and immediate hazards to the subject(s).

VI.2.1.9. Non-compliance with any provision of this clause may result in withholding of payments under the grant pursuant to the grant's payments clause(s) and/or grant termination pursuant to the grant's termination clause(s). The Government shall not be responsible for any costs incurred for research involving human subjects prior to protocol approval by the HROB.

VI.2.2. Animal Use

VI.2.2.1. It is not anticipated that animal use would be involved in Basic Research. If the proposed research does involve animal use, however, offerors are asked to justify the use of animals and to address the following issues: Any proposals that include animal studies or animal work must submit detailed information on the animal protocols to be used and verify the location where the studies will be conducted. Animal studies are subject to review and approval for safety and adherence to regulations. This information, if applicable, must be included in Volume III, Supplemental Information, of the Phase II Full Proposal. Further information may be required if the Proposal is successful.

VI.2.2.2. DoD Directive 3216.1, dated April 17, 1995, provides policy and requirements for the use of animals in DoD-funded research. The DoD definition of Animal is "any live nonhuman vertebrate." All proposals that involve the use of animals must address compliance with DoD Directive 3216.1. DTRA requires that research using animals not begin or continue until DTRA has reviewed and approved the proposed animal use. For animals, the provisions include rules on animal acquisition, transport, care, handling, and use in: (i) 9 CFR parts 1-4, Department of Agriculture rules that implement the Laboratory Animal Welfare Action of 1966 (U.S.C. § 2131-2156); and (ii) the "Guide for the Care and Use of Laboratory Animals," National Institutes of Health Publication No. 86-23. For grants awarded to foreign institutions, you must follow either local or US laws (as stated above) depending on which laws provide stronger protection.

VI.2.3. Biological Defense Research Program (BDRP) Requirements: BioSurety and Select Agent Use.

VI.2.3.1. Proposals must specify what Select Agent work will be conducted at the offeror's facility and what Select Agent work will be performed in other facilities. Proposals also must provide the source of the Select Agent(s), any appropriate registration information for the facilities, and specify the Laboratory Biosafety Level. All Select Agent work is subject to verification of information and certifications. This information, if applicable, must be included in Volume III, Supplemental Information, of the Phase II Full Proposal. Further information may be required if the proposal is successful.

VI.2.3.2. For those institutions in which PI's are conducting research with Bio-safety Levels 3 and 4 material, a Facility Safety Plan must be prepared and made available during the project award phase in accordance with 32 Code of Federal Regulations (CFR) 626.18. for grants awarded to foreign institutions, you must follow either local or US laws (as stated above) depending on which laws provide stronger protection. (DTRA requires that research using Select Agents not begin or continue until DTRA has reviewed and approved the proposed agent use. See URL: www.access.gpo.gov/nara/cfr/waisidx_99/32cfr626_99.html for a copy of 32 CFR 626.18, Biological Defense Safety Program).

VI.2.4. Intangible Property. In accordance with DoDGARS §32.36.

VI.3. Reporting. General requirements are provided below; however, each grantee should check the award agreement to determine any deviations.

VI.3.1. Annual Reports: Annual reports will be due no later than 1 September of each year. Grants effective after 31 July will not require a progress report until 1 September of the following year.

VI.3.2. Final Technical Reports: A comprehensive final technical report is required at the end of an effort, due on the date specified in the grant document.

VI.3.2.1. The purpose of the final report is to document and to transition the results of the effort into the DTRA and DoD applied research community. The final report will always be sent to the Defense Technical Information Center (DTIC) and unclassified reports will be available to the public through the National Technical Information Service (NTIS).

VI.3.3. The following financial reports are required for all grant recipients:

- Federal Financial Report, SF425. This report is due annually, no later than 90 days after the end of the reporting period. The reporting period shall be from 1 August – 31 July. First year reports shall have a reporting period of the start date of the grant through 31 July. Final reports shall be submitted no later than 90 days after the project or grant period end date.

VI.3.4. All reports shall be submitted to the Office of Naval Research Office identified in the Research Grant. All technical reports shall also be submitted via email to the following address: BasicResearch@dtra.mil.

VI.3.5. After-the-Award Requirements. Closeout, subsequent adjustments, continuing responsibilities, and collection of amounts due are subject to requirements found in DoDGARs §32.71 through 73.

VI.3.6. Foreign Travel Reporting Requirement. Within thirty (30) days after returning to the United States from foreign travel, the PI shall submit an acceptable trip report to the Grants Officer summarizing the highlights of the trip. For grants awarded to institutions entirely located outside the United States and/or its territories, this is not required.

VII. AGENCY CONTACTS

VII.1. The email address for all BAA correspondence and questions, the submission website, and other important information:

E-mail address for all BAA correspondence and questions	HDTRA1-08-10-BRCWMD-A@dtra.mil
BAA Announcement	http://www.fbo.gov http://grants.gov
DTRA Proposal Submission Website (requires registration prior to Proposal submission)	https://www.dtrasubmission.net/ http://grants.gov
DTRA Website	http://www.dtra.mil

VII.2.Questions regarding the technical and administrative content of this BAA must be addressed to the e-mail address listed above. All questions must include the BAA number in the subject line.

VII.3.DTRA will post questions and answers relevant to all potential offerors to the grants.gov website by the date specified in Section IV.3. It is the offeror's responsibility to periodically check the grants.gov website to view postings of questions and answers, in addition to any applicable amendments to the BAA.

VII.4.Please note that answers will not be provided nor any judgment made related to questions concerning the applicability of certain projects to the scope of this BAA.

VIII.OTHER INFORMATION

VIII.1. Export Control Notification. Offerors are responsible for ensuring compliance with any export control laws and regulations that may be applicable to the export of and foreign access to their proposed technologies. Offerors may consult with the Department of State with any questions regarding the International Traffic in Arms Regulation (ITAR) (22 CFR Parts 120-130) and/or the Department of Commerce regarding the Export Administration Regulations (15 CFR Parts 730-774).

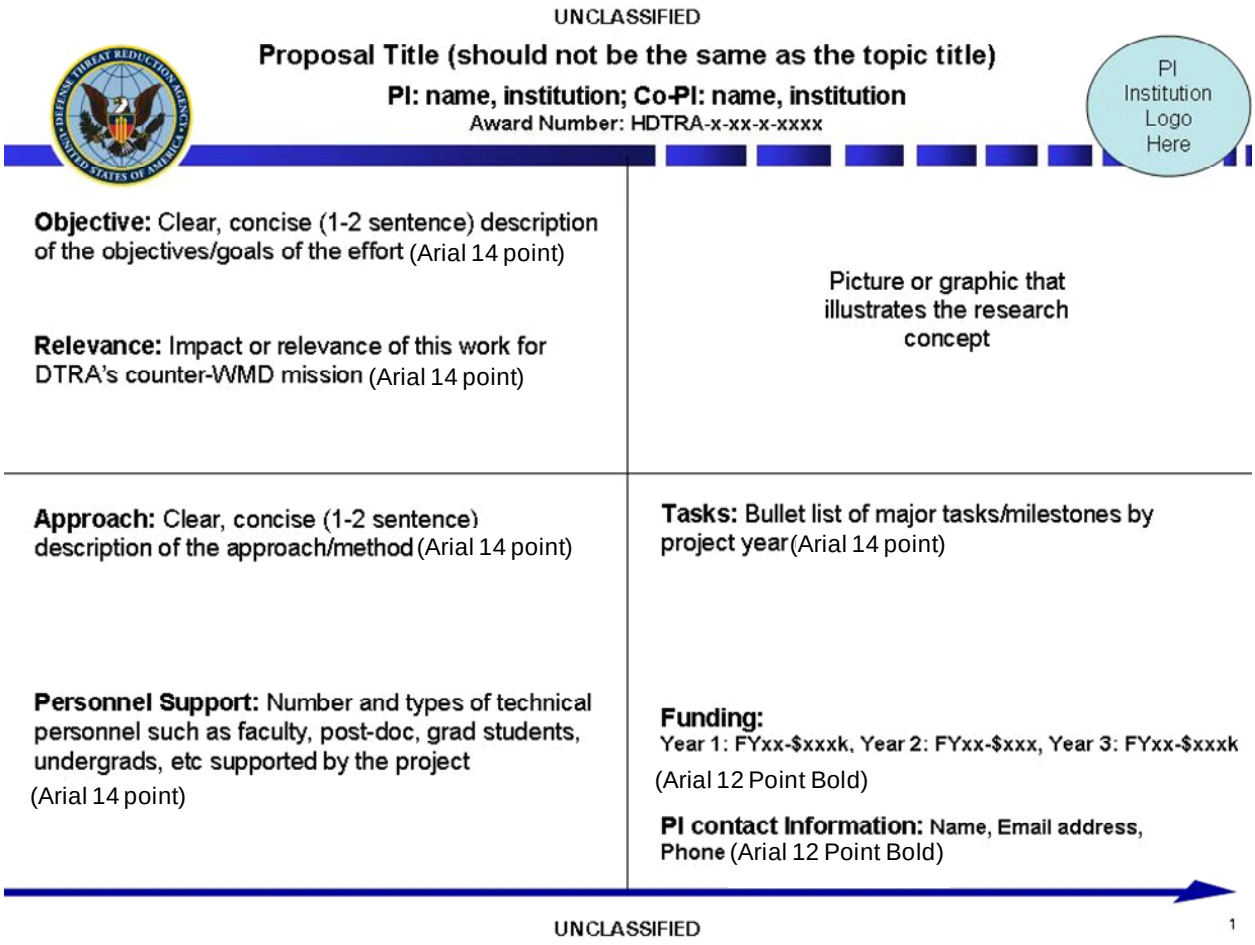
VIII.2. Organization Conflict of Interest Advisory. Certain post-employment restrictions on former federal officers and employees may exist, including special Government employees (including but not limited to 18 U.S.C § 207, the Procurement Integrity Act, 41 U.S.C. § 423). If a prospective offeror believes that a conflict of interest exists, the situation should be raised to the DTRA Grant Officer before time and effort are expended in preparing a Proposal. All offerors and proposed sub-contractors must therefore affirmatively state whether they are providing scientific, engineering and technical assistance (SETA), advisory and assistance services (A&AS) or similar support, through an active contract or subcontract, to any DTRA technical office(s), the Joint Program Executive Office (JPEO), Assistant to the Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs (ATSD-NCB), or the Office of the Special Assistant for Chemical and Biological Defense and Chemical Demilitarization Programs (OSA (CBD&CDP)). This information must be included in Volume III, Supplemental Information, of the Phase II full Proposal. All affirmations must state which office(s) the offeror supports, and identify the prime contract number. Affirmations must be furnished at the time of Proposal submission. All facts relevant to the existence or potential existence of organizational conflicts of interest must be disclosed. The disclosure must include a description of the action the offeror has taken or proposes to take to avoid, neutralize, or mitigate such conflict.

IX. ATTACHMENTS

ATTACHMENT 1	QUAD CHART TEMPLATE
ATTACHMENT 2	TECHNOLOGY READINESS LEVEL DEFINITIONS
ATTACHMENT 3	WHITE PAPER FORMAT
ATTACHMENT 4	PHASE II TECHNICAL PROPOSAL TEMPLATE
ATTACHMENT 5	PHASE II COST PROPOSAL TEMPLATE
ATTACHMENT 6	STATEMENT OF WORK (SOW) TEMPLATE
ATTACHMENT 7	SUBMISSION CHECK LIST
ATTACHMENT 8	PROPOSAL TOPICS
ATTACHMENT 9	NOTICE REGARDING USE OF GRANT.GOV APPLY
ATTACHMENT 10	SAMPLE GRANT WITH DTRA TERMS AND CONDITIONS

ATTACHMENT 1: QUAD CHART TEMPLATE

A quad chart that contains the following information must be included in Volume III, Supplemental Information, of the Phase II full proposal and must be positioned in a landscape view. Any quad chart submitted that exceeds the one-page limit will not be read or evaluated. Please note that the Title of the Project should be different than that of the Topic.



ATTACHMENT 2: TECHNOLOGY READINESS LEVEL (TRL) DEFINITIONS

Technology Readiness Levels (TRLs) provide a systematic metric/measurement system that supports assessments of the maturity of a particular technology and the consistent comparison of maturity between different types of technology. TRLs were originally developed and used by the National Aeronautics and Space Administration (NASA) for technology planning. The use of TRLs has been widely adopted in government and industry. The Department of Defense (DoD) has adopted the use of TRLs as documented in the current DoD-5000 series publications.

The table below provides notional TRL descriptions for non-medical systems. It is noted that for Basic Research, projects should be TRL 1 or TRL 2. Generally when the maturity of the science reaches a TRL 3 it is no longer Basic Research.

Technology Readiness Level	**Acquisition Guidebook** **(30 October 2002)** **https://acc.dau.mil/CommunityBrowser.aspx?id=18545**
1. Basic principles observed and reported.	Lowest level of technology readiness. Scientific research begins to be translated into Applied Research and development. Examples might include paper studies of a technology's basic properties.
2. Technology concept and/or application formulated.	Invention begins. Once basic principles are observed, practical applications can be invented. Applications are speculative and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.
3. Analytical and experimental critical function and/or characteristic proof of concept.	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.

ATTACHMENT 3: PHASE I WHITE PAPER FORMAT AND PREPARATION INSTRUCTIONS

Phase I White Paper Template

The white paper narrative must specify a single topic area by identifying at the end of the project title the specific topic letter referenced in Attachment 8 of this BAA.

FORMAT

- Paper size: 8.5 x 11 inches
- Spacing: Single-spaced
- Margins: One-inch margins
- Font: Times New Roman, not smaller than 12 point
- Title: Not the same as the title of the topic; the title of the white paper should be unique
- Number of pages: No more than four (4) pages (excluding the cover letter and the cover sheet). The Government reserves the right to evaluate only those pages within the stated limitations.

CONTENT

- A one-page cover letter (optional) not counted in the 4 page limitation.
- The cover page provided via the web-based submission site shall be filled out in its entirety and is not counted in the 4 page limitation.
- The abstract should state the objective of the proposed research, how the proposed research contributes to the C-WMD science needs outlined in the topic, and the unique approach proposed.
- Identification of the research (including topic area letter and title embedded in the introduction) and issues.
- Proposed technical approaches.
- Potential scientific impact to provide greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts, including how the research contributes to the C-WMD science needs outlined in the topic.
- Potential team and management plan. Multi-investigator, multi disciplinary white papers should carefully detail the contribution from each of the investigators and clearly outlined the contribution to C-WMD science.

- Summary of estimated costs.

The white paper should provide sufficient information on the research being proposed (e.g., the hypothesis, theories, concepts, approaches, data measurements, and analysis, etc.) to allow for an assessment by a technical expert.

*It is not necessary that white papers carry official institutional signatures.

ATTACHMENT 4: PHASE II TECHNICAL PROPOSAL FORMAT AND PREPARATION INSTRUCTIONS

Phase II Technical Proposal Template

The technical proposal has a page limit for the entire document. Any pages submitted that exceed the page limit will not be read or evaluated. See Section IV.2.2 for page limits.

I. **ABSTRACT.**

II. **SCOPE**. This Proposal is in support of the Basic and Applied Sciences Directorate and the JSTO and *[cite the same topic title as used on the Quad Chart.]*

A. **OBJECTIVE**. *[A clear and concise objective of the proposed project]]*

B. **BACKGROUND.** *[Provide the necessary technical and scientific background to support the scientific and/or technical merit of the proposed project.]*

C. **PROGRAMMATICS.** This effort will support DTRA initiative _____ (e.g., Topic Letter) _____ aimed at advancing the state of the science and body of knowledge for *[state the topic area] [Describe your organization's management plan for the proposed project; list supporting and collaborating centers, and the roles/responsibilities of each identified academic and/or industrial sub-contractor supporting the project]*.

D. **RELEVANCE**. *[Describe the relevance of the proposed project in terms of advancing the state of the science and the anticipated scientific impact on capabilities needed potential to reduce, eliminate, and counter provide greater knowledge or understanding of the threat, and mitigate the effects of WMD fundamental aspects of phenomena and of observable facts.]*

III. **CREDENTIALS.** *[Describe your and the organization's qualifications to perform the proposed work. Summarize the credentials of the primary performing center, and supporting academic and industrial partners to perform the work. Describe specific examples of similar work performed, and equipment and/or facilities available to perform the proposed work. List summary qualifications of PI and other key personnel. Focus on information directly relevant to the proposed work.]*

A. Summary of Credentials

B. Summary of Qualifications for PI and Key Personnel

C. Summary of Facilities to Perform the Proposed Work

IV. **WORK TO BE PERFORMED.** *[Provide details of the work to be performed by task and subtask.]*

A. **GENERAL**. *[Provide an overview]*

B. **<u>SUMMARY</u>:** *[List as many tasks as appropriate, and list tasks for all years of research proposed, adding years to the template below as necessary.]*

Year #1 (Year X)

Task 1: Appropriate Task Title 1

Task 2: Appropriate Task Title 2

Task 3: Appropriate Task Title 3

Year #2 (Year X)

Task 4: Appropriate Task Title 4

Task 5: Appropriate Task Title 5

Task 6: Appropriate Task Title 6

C. **<u>DETAILED TASKS</u>.** *[Describe the details of all tasks listed in above section.]*

i. **Task 1: Appropriate Task Title 1 (Year X)** *[Include what will be accomplished, how the task will be performed, the resources allocated against the task (personnel involved, man hours and/or percent (%) effort, material, etc.), and the appropriate metrics to measure progress, and deliverable(s). Describe the applicable subtasks involved.]*

ii. **Task 2: Appropriate Task Title 2 (Year X)** *[etc.]*

V. **PERFORMANCE SCHEDULE.** *[Provide a table of tasks and sub-tasks and the duration of performance of each in a Gantt or other suitably formatted chart.]*

VI. **REFERENCES.** *[List any relevant documents referenced in Section I.]*

ATTACHMENT 5: PHASE II COST PROPOSAL FORMAT AND PREPARATION INSTRUCTIONS

The cost proposal must include, at a minimum, two separate sections (provided in one submission): a cost summary, not to exceed two-pages (see 'A', below), must precede the detailed cost portion (see 'B' below) of the cost proposal. See Section IV.2.2 of the BAA for additional information pertaining to the cost proposal. Additionally, include cost submissions for all subcontractors to also include consultants.

A. COST SUMMARY (not to exceed 2 pages).

A summary cost proposal must be prepared that includes the following items, listed by year of performance, including all proposed years: Add as many years to the summary as will be included in the full proposed period of performance. Note: The periods of performance must match the information presented in the Statement of Work. Include the unique topic identifier and the project title on all pages.

Description	**Year 1**	**Year 2**	**Year 3**	**Year 4** (if applicable)	**Year 5** (if applicable)	**TOTAL**
Direct Labor – total costs (excluding subcontractors)	$	$	$	$	$	$
Total Fringe Benefits (prime only)	$	$	$	$	$	$
Total Subcontract Costs (labor, travel, etc.)	$	$	$	$	$	$
Total Domestic Travel Costs (prime only)	$	$	$	$	$	$
Total Foreign Travel Costs (prime only)	$	$	$	$	$	$
Total Tuition (prime only)						
Total Direct Materials and Supplies (prime only)*	$	$	$	$	$	$
Total Direct Equipment (prime only)*	$	$	$	$	$	$
Total Publication Costs (prime only)	$	$	$	$	$	$
Total Other Direct Costs (prime only; NOT including	$	$	$	$	$	$

subcontract costs)						
Total Indirect Costs (prime only)	$	$	$	$	$	$
Grand Total (all costs)	$	$	$	$	$	$

*Note: itemize any planned items costing greater than $10,000 (unit cost); include in Total Direct Material/Equipment and itemize individual equipment/material (greater than $10,000) immediately following the table.

B. DETAILED COST (no page limit; offeror format acceptable)

Budgeted cost elements should reflect the following:

a. Man-hours and/or percent (%) effort being charged to the project, for whom (PI, graduate students, etc.), and the commensurate salaries and benefits. Allowable charges for graduate students include salary, appropriate research costs, and tuition. Allowable charges for undergraduate students include salary and research training costs, but not tuition.

b. Cost of equipment, based on most recent quotations and itemized in sufficient detail for evaluation.

c. Travel costs and duration, and the relevance to stated objectives; destinations, if known and number of travelers per trip.

d. Estimate of material and operating costs.

e. Publication and report costs.

f. Consultant fees (indicating daily or hourly rate) and travel expenses and the nature and relevance of such costs.

g. Computer services.

h. Subcontract costs and type (the portion of work to be subcontracted and rationale). Include detailed cost summary from the subcontractor.

i. Communications costs not included in overhead.

j. Other Direct Costs.

k. Indirect costs must be less than 35% of the total grant value per the 2008 and 2009 DoD Appropriations Acts. This requirement currently applies to awards made using FY08 and FY09 Basic Research funds and may apply to future awards.

ATTACHMENT 6: STATEMENT OF WORK (SOW) FORMAT AND PREPARATION INSTRUCTIONS

SOW Template

An SOW must be included in Volume III, supplemental information, of the Phase II full proposal. The SOW does not have a page limit, but should be approximately 3-5 pages in length that is paginated separately and distinct from the other pages in Volume III suitable for incorporation into the procurement instrument. Do not put proprietary data or markings in the SOW. Pages should be numbered and the initial page should have a date (document date) shown under the title.

The proposed SOW must accurately describe the research to be performed. The proposed SOW must also contain a summary description of the technical methodology as well as the task description, but not in so much detail as to make the SOW inflexible. The SOW format follows:

1) Objective: This section is intended to give a brief overview of the specialty area and should describe why the research is being pursued, and what you are trying to learn.

2) Scope: This section includes a statement of what the SOW covers. This should include the research area to be investigated, objectives/goals, and major milestones and schedule for the effort.

3) Background: The offeror must identify appropriate documents, including publications that are applicable to the research to be performed. This section includes any information, explanations, or constraints that are necessary in order to understand the hypothesis and scientific impact on capabilities needed to reduce, eliminate, and counter the threat, and also mitigate the effects of Weapons of Mass Destruction (WMD). It may also include studies previously undertaken.

4) Tasks/Scientific Goals:

   a) This section contains the detailed description of tasks which represent the research to be performed that are contractually binding. Thus, this portion of SOW should be developed in an orderly progression and presented in sufficient detail to establish the methodology and feasibility of accomplishing the overall program goals. The work effort should be segregated by performance period for all tasks to be performed and anticipated milestones realized in that year (e.g., Year 1, Year 2, and Year 3 should be detailed separately if proposed). Identify the major tasks in separately numbered sub-paragraphs. Each major task should delineate, by subtask, the research to be performed by year and number each task using the decimal system (e.g. 4.1, 4.1.1, 4.1.1.1, 4.2, etc.). The sequence of performance of tasks and achievement of milestones must be presented by fiscal year and task, the same as in Section III of the Technical Proposal and the SOW must contain every task to be accomplished to include a detailed schedule.

   b) The tasks must be definite, realistic, and clearly stated. Use “the grantee shall” whenever the work statement expresses a provision that is binding. Use “should” or “may” whenever it is necessary to express a declaration of purpose. Use “will” in cases where no offeror requirement is involved; e.g., power will be supplied by the Government. Use active voice in

describing work to be performed.

c) Do not use acronyms or abbreviations without spelling-out acronyms and abbreviations at the first use; place the abbreviation in parenthesis immediately following a spelled-out phrase.

d) If presentations/meetings are identified in your schedule, include the following statement in your SOW: "Conduct presentations/meetings at times and places specified in the grant schedule."

ATTACHMENT 7: PROPOSAL SUBMISSION CHECKLIST

(for convenience/informational purposes)

Proposal Submission Website Registration

Data to be Entered in Website for Cover Sheets

1) Point of Contact (POC) Information
2) Address and Country
3) Data Universal Number System (DUNS) Number
4) Tax Identification Number (TIN)
5) North American Industry Classification System (NAICS)
6) Commercial and Government Entity (CAGE) Code
7) Institution Type (Large or Small Business, Academic, etc.)
8) Regional Defense Finance and Accounting Service (DFAS) Office
9) Regional Office of Naval Research (ONR) Office (applies to Universities only)

Phase I

1) White Paper
2) Printed Confirmation of Upload of Phase I Proposal

Phase II

1) Volume I: Technical Proposal (PDF Upload)
2) Volume II: Cost Proposal (PDF Upload)
3) Volume III: Supplemental Information (PDF Upload)
4) Quad Chart
5) Statement of Work
6) DUNS, TIN, & NAICS
7) Certifications and Representations:

    Central Contractor Registration (CCR)

    Human Subjects

    Animal Use

    BioSurety and Select Agent Use

    Organizational Conflict of Interest Advisory

    Intangible Property Assertions

Authorized Offeror Personnel

Statement of Current and Pending Support

ONR/DCAA/DFAS Representatives

Confirmed Proposal Expiration Date

Supporting letter for Young Investigator Awards

Supporting rationale of a portfolio predominantly in Basic Research (not for Universities)

8) Printed Confirmation of Upload of Phase II Proposal

ATTACHMENT 8: PROPOSAL TOPICS

PROPOSAL TOPICS

To accomplish its basic research mission, DTRA's proposal topics are aligned with five major functional counter Weapons of Mass Destruction (WMD) research thrusts. These thrusts provide the context for creativity, imagination and discovery of fundamental principles, methods and approaches that ultimately lay the foundation for significant new capabilities to counter current and emerging threats from WMD. To this end proposals may be considered which respond to the detailed topics that correspond to any one of the following five thrust areas:

I. DTRA Basic Research Thrust Areas

1. ***Science of WMD Sensing and Recognition:*** The basic science of WMD sensing and recognition is the fundamental understanding of materials that demonstrate measurable changes when stimulated by radiation or particles from WMD in the environment. This research thrust involves exploration and exploitation of interactions between materials and various photons, molecules, nuclear radiation and/or particles. These interactions and the specific form of recognition they provide are used for subsequent generation of information that provides knowledge of the presence, identity, and/or quantity of material or energy in the environment that may be significant.
2. ***Cognitive and Information Science:*** The basic science of cognitive and information science results from the convergence of computer, information, mathematical, network, cognitive, and social science. This research thrust expands our understanding of physical and social networks and advances knowledge of adversarial intent with respect to the acquisition, proliferation, and potential use of WMD. The methods may include analytical, computational or numerical, or experimental means to integrate knowledge across disciplines and improve rapid processing of intelligence and dissemination of information.
3. ***Science for Protection:*** Basic science for protection involves advancing knowledge to protect life and life-sustaining resources and networks. Protection includes threat containment, decontamination, threat filtering, and shielding of systems. The concept is generalized to include fundamental investigations that reduce consequences of WMD, assist in the restoration of life-sustaining functions and support forensic science.
4. ***Science to Defeat WMD:*** Basic science to defeat WMD involves furthering the understanding of explosives, their detonation and problems associated with accessing the target WMDs. This research thrust includes the creation of new energetic molecules/materials that enhance the defeat of WMDs, the improvement of modeling, and simulation of these materials and various phenomena that affect success and estimate the impact of defeat actions, and investigation of novel methods that may yield order-of-magnitude improvements in energy and energy release rate.
5. ***Science to Secure WMD:*** Basic science to support securing WMD includes: (a) environmentally responsible innovative processes to neutralize chemical, biological, radiological, nuclear, or explosive (CBRNE) materials and components; (b) discovery of revolutionary means to secure components and weapons; and (c) studies of scientific principles that lead to novel physical or other tags and methods to monitor compliance and disrupt proliferation pathways. The identification of basic phenomena that provide verifiable controls on materials and systems also helps arms control.

Note that all topics specifically request basic research and do not request applied research and/or advanced technology development. The basic research topics detailed below are specifically aligned with the DoD definition of basic research and the recommendations of the 2005 Report from the National Research Council's Committee on DoD Basic Research Division on Engineering and Physical Science – "Assessment of DoD Basic Research". Per Recommendation 1 of that assessment – "Basic Research is systematic study directed toward greater knowledge or understanding the fundamental aspects of phenomena and has the potential for broad, rather than specific, application."
Please note the following:

- Proposals that address technologies at a Technology Readiness Level of 3 (TRL3) or greater will not be considered.
- Proposals offering the development of devices (e.g., sensors) will not be considered.
- Proposals offering answers for specific societal or computer system applications will not be considered.
- The topics and thrust areas within this document are all equally weighted and are not given any priority levels.
- Topic research areas are representative of the sought research, but should not limit innovative research ideas aligned with the topic intent.

II. DTRA Basic Research Topic Areas—Period 4

Topic Per4-A: Charge Collection and Photon Conversion for Radiation Sensing (Thrust 1)

Background: Radiation detection technologies to support the interdiction of nuclear and radiological materials are critical to combating nuclear and radiological terrorism. All current radiation detection systems require either charge collection (for gaseous or semiconductor based systems) or photon conversion (for scintillators) to initiate generation of a current or voltage pulse that leads to a "detectable" signal. For semi-conductor detectors, an ionizing event within the depleted region of the detector generates charge pairs that then migrate to the anode and cathode of the detector. Contacts applied to the detector surface generally serve to apply bias as well as collect the charge that successfully reach the contact. The collected charge is superimposed over the semiconductors noise sources, which tend to reduce resolution and establish a lower bound on detectable signal. Greater understanding of the contact / semiconductor interface may lead to more efficient charge collection and means to reduce thermal and shot noise that in-turn will lead to improved signal-to-noise ratios. For scintillators, it is generally recognized that resolution is limited by the statistical variation in the production of electrons from photons incident on a photon converting surface such as the photo-cathode used in conventional photomultiplier tubes (PMTs). Whereas PMT are inherently low noise, they have other characteristics that are undesirable to include size, cost, and power requirements. Investigation of novel photo-conversion materials and processes that are low noise and demonstrate high quantum efficiency may lead to devices that achieve much higher sensitivity and energy resolution.

Impact: A better understanding of semiconductor surface electronic and physical structure will provide lower uncertainties in detector performance. Better understanding of both charge

collection and light conversion processes may lead to innovation in semiconductor and scintillators systems that all improved energy resolution and decreased noise.

Objective: The objective of this solicitation is to support the understanding of the underlying mechanisms, limitations and potential advancements that can be made in the collection of charge from semi-conductor materials or photon conversion from scintillator materials. The scope includes increasing basic understanding of the surface and contact interface properties of semiconductors that minimize shot and thermal noise and maximize usable signal collection. This encompasses exploration of the electronic structure of semiconductor detector surfaces and contact interfaces to optimize detector signal to noise ratio. The scope also includes examining fundamental properties of photon-to-electron conversion processes and the exploration of materials and devices that permit high quantum efficiencies while also reducing noise sources for a range of radio-luminescent materials.

Research areas may include but are not limited to the following areas:

- Fundamental research into charge collection from contacts of semi-conductor materials.
- Research in semiconductor detector materials surface physical and electronic structure.
- Research in contacting materials to reduce noise generation.
- Research in photoelectric conversion processes that achieve high quantum efficiencies for photons over a wide optical range, particularly at wavelengths < 425 nm.
- Unconventional means of light conversion that result in measurable signals that preserve energy information.

Average Award Amounts for Topic A:

- Single Investigator Awards will average approximately $150,000 per year.
- Single Grant/Multiple Investigator Awards will average approximately $350,000 per year.

Topic Per4-B: Post-Detonation Radiological and Nuclear Forensics (Thrust 1)

Background: This topic explores ways to enable accurate post-detonation analysis of debris from a radiological or nuclear event on a short time scale. The Department of Defense provides the capability to collect and analyze post detonation debris. DTRA is responsible for research and development that will enable this post-detonation forensics. The current methodology includes a radiochemical assay that requires an inordinately long time to obtain statistically accurate results. The advancement of analytical techniques could lead to the ability to accurately analyze debris on time scale shorter than this current methodology (~ 1 week). Ideally, this topic seeks novel methodologies which are non-destructive, allowing additional confirmation using the identical sample. Furthermore, a need exists to improve the capability of sample collection; to this end this topic seeks novel methods which have the potential of being more robust under a wide variety of adverse conditions. Also of interest are techniques for material reconstruction that may lead to the determination of the radionuclide source activity after an RDD (radiological dispersal device) detonation.

Impact: The development of advanced post detonation forensics addresses DTRA's counter WMD need to enable prevention of future detonations, enable identification of those responsible, and aid in response and recovery efforts. Such research has the potential to lead to a field deployable system with a real time analysis capability.

Objective: This topic explores novel methods and advancements in the ability to collect samples of material, analyze radioactive debris, and identify signatures from debris analysis in a post detonation environment. Specific interests include the investigation of non-destructive analytical techniques and signatures for material reconstruction. Proposals that engage government laboratory (DoD) institutions are also encouraged.

Research areas may include but are not limited to the following areas:

- Novel methods for rapid isotopic identification and measurement after a nuclear or radiological detonation.
- Emphasis will be placed on non-destructive analytical techniques
- Emphasis will be placed techniques with the potential to eliminate the need for separative radio-chemistry.
- Areas of consideration in this research area may include Nuclear Magnetic Resonance (NMR), Neutron Activation Analysis (NAA), laser spectroscopy, mass spectrometry, and ligand based techniques.
- Identification of necessary signatures from debris analysis to enable material reconstruction of radiological dispersal devices.
- New methods for sample collection after a nuclear or radiological attack.

Average Award Amounts for Topic B:

- Single Investigator Awards will average approximately $150,000 per year.
- Single Grant/Multiple Investigator Awards will average approximately $350,000 per year.

Topic Per4-C: Advanced Methods and Algorithms to Support Course of Action Analysis of Terrorists Seeking to Acquire and Use CBRNE (Thrust 2)

Background: DTRA requires the ability to identify and assess alternate courses of action in response to efforts by adversarial groups to acquire and especially to use chemical, biological, radiological, nuclear and high explosive (CBRNE) weapons of mass destruction (WMD). In order to provide timely, useful and coordinated responses, combatant commanders and other decision makers must be provided courses of action that have been assessed as suitable for the scenarios they face. Scenario-based course of action (COA) assessment requires integration of diverse types of information, the evaluation of information under uncertainty, rapid identification of key and relevant patterns in data and the ability to predict and identify cascades of events resulting from WMD attacks and socio-technical responses of humans to them. Appropriate courses of action must also take into account operator and analyst responses to potential information and uncertainty overload in critical situations of the sort entailed in potential WMD use. Advances in comprehensive scenario-based COA methods and algorithms are needed in order to support the development of computational tools for 'what if' analysis.

Impact: This research will advance basic science understanding and methods needed to support scenario-based operational Course of Action analysis. Effective scenario-based "what if" analysis is required to support combatant commanders and other decision makers with insights into potential courses of action in response to efforts by adversarial groups to acquire and use CBRNE WMD. In addition, this research will contribute to improved decision support tools by identifying and providing potential mitigation for operator and analyst information overload in critical situations.

Objective: The objective of this effort is to conduct basic research to advance understanding of and discover novel methods and algorithms that can contribute to comprehensive scenario-based Course of Action analysis with regard to the acquisition and use by terrorists of CBRNE for Combating Weapons of Mass Destruction (CWMD). Advances required include the need to model, analyze and integrate the full spectrum of intelligence data, social behavior, cognitive intent and infrastructure damage. The research includes but is not limited to the following goals:

- Integrate large amounts of data using advanced methods from sensors and other sources using concept representations (such as formal ontologies) or other methods that result in increased ability of software to merge and interpret data intelligently, in real time.
- Investigate novel ways to integrate measures of certainty/uncertainty with data and to support effective and timely 'reasoning under uncertainty' algorithms suitable to very large data sets.
- Ability to perform rapid data mining –computationally tractable algorithms for rapidly identifying key patterns in very large data sets under time constraints.
- Investigate the use of modeling societal activities and insults during a WMD attack to an urban population. Enhance the ability to predict and identify cascades of events resulting from WMD attacks or events including socio-technical interactions of humans and infrastructure networks.
- Understand intelligence, surveillance and reconnaissance (ISR) operator and analyst responses to potential information and uncertainty overload. Identify factors such as improved information system interfaces and operational procedures to support operational teams.

- Investigate advanced intelligent software algorithms for information evaluation, fusion and presentation.

Average Award Amounts for Topic C:

- Single Investigator Awards will average approximately $150,000 per year.
- Single Grant/Multiple Investigator Awards will average approximately $350,000 per year.

Topic Per4-D: **Advancing Knowledge of Network Theory for Network Analysis and Response to Attacks (Thrust 2)**

Background: In order to preserve essential military capabilities following an attack employing weapons of mass destruction (WMD), one must be able to predict the interdependent responses of the military and national infrastructure networks that define the military capability in response to damage and to changes in network demand that result from such an attack. These include military networks (US and coalition), like the defense strategic communications system, global information grid (GIG) and battlespace networks; non-military networks, the national power grid and transportation grids. Critical considerations in the face of WMD disruption are network availability, interoperability, robustness and recovery. The basic nature of a WMD attack is that multiple nodes will be compromised simultaneously to varying degrees through a multitude of failure mechanisms – some common mode, others implementation-specific, still others as a result of dependencies. The space- and time-correlated details of the damage and the specific nature of the faulty behavior are not known a priori. The WMD stressors to networks can include, for example, widely distributed failures of electronics from nuclear electromagnetic pulse or the long-term denial of network elements or segments due to WMD contamination from NBC material as well as direct physical damage. Many current management approaches and policies of network systems contain static assumptions about the structure of network, and they do not account for time dependent variation in traffic type, significant changes in the number of operating nodes, changing security conditions and changed user demands, including the potential need to prioritize network traffic. In order to understand the critical vulnerabilities and develop avoidance/recovery strategies of such diverse, yet interdependent networks to WMD attack, a fundamental understanding of the approaches which capture network dynamics is required. This effort is intended to answer questions like: What are the essential elements of any network? How do different implementations impact on interoperability, vulnerability, survivability and recovery of networks in a WMD environment? What is the mix of implementations that optimize these measures? What data would be most valuable to collect from existing networks to supplement/validate the mathematical and statistical models that will be developed under this effort? What are adaptive network policies and optimization methods? What are routing approaches for networks with variable connectivity and information content? What policies are suitable for managing user demand in the event of major attacks?

Impact: This research will advance theoretical understanding and methods necessary to improve network robustness, management and recovery. Understanding the fundamental properties that contribute to the robustness of networks will support system reliability, survivability and security. This research will identify methods to use indirect information (e.g. peacetime performance indicators or network outages from natural events) for determining what data and how much data are needed to adequately understand the impact of WMD stressors on complex networks. This will impact many areas such as sensor networks, telecommunications, and

systems of systems. Defense systems and operating procedures will be optimized to ensure the maintenance of capabilities rather than individual systems, reducing acquisition costs and increasing WMD survivability and operability.

Objective: The objective of this effort is to conduct basic research to advance current knowledge of physical, social and techno-social network behavior and to identify optimal responses to large scale/global, network outages that occur almost simultaneously due to a single Weapons of Mass Destruction (WMD) threat event. High value is placed on science-based mathematical and statistical methods to determine intra- and inter-network failure modes and dependencies and methods to increase network robustness to avoid/minimize WMD stressor impacts. The main thrust of this network topic is to extend prior research to be more specific in defining WMD environments and target networks layers.
Some of the research areas may include (but not be limited to):

- Advances in theoretical understanding or mathematical modeling of the properties of complex networks that cannot be described in terms of graphs or methods used for simple networks and analysis of key aspects of topologies that govern network response to WMD stressors.
- Classification and modeling of attacks on communication and other infrastructure networks to define survivability metric accounting for robustness, fragility, reconfigurable and self-healing of the network.
- Advances in inference algorithms capable of identifying damage via targeted and limited tests. Advances in network control and routing strategies to mitigate network damage. The technique should target design of properly balanced distributed and centralized control of the damage.
- Analysis of optimal structure of networks built to withstand very rare but devastating attacks/outages and capable of fast and least centralized recovery.
- Advances in network forensic for detecting and predicting rare malicious activities and distinguishing them from benign activities over the networks.
- Development of stable and effective network management algorithms for real time allocation of network resources with minimum latency, overhead, and complexity.
- Analysis of key aspects and dynamics in socio-technical networks including cross-layer interactions between social networks and underlying physical and communication layers under WMD stressor impacts.

Average Award Amounts for Topic D:

- Single Investigator Awards will average approximately $150,000 per year.
- Single Grant/Multiple Investigator Awards will average approximately $350,000 per year.

Topic Per4-E: Self-Healing Radiation Shielding Materials (Thrust 3)

Background: Nuclear detonations may damage or degrade electronics through effects such as X-ray exposure, or creation of artificial radiation belts (i.e., energetic beta particles). Aluminum is a commonly used shielding material for spacecraft electronics, and is also commonly used in various other structures in satellites. Other materials may assist in shielding.

In extreme cases, solar events may drive intense particle exposure with energies in excess of 1 MeV to greater than 1 GeV (e.g., a proton flux that is orders of magnitude beyond fluxes

normally encountered in Low Earth Orbit, LEO). Interactions between highly energetic charged particles and nuclei in metals, including those used for shielding, may increase some types of radiation.

Biomimetics involves the study of biological principles to discover new approaches to design artificial systems or components. This general approach suggests research into healing methods for man-made systems. In the case of satellite structures, self-healing is a desirable approach to compensate for inaccessibility.

Self-healing materials incorporate the function to repair the material structure (especially for non-metals) in response to damaging effects such as may be caused by ultraviolet exposure, atomic oxygen, or intense radiation. Failures at the microscopic level can be repaired, for example, by materials that release adhesives and catalysts to drive polymerization. Other approaches have been or are under consideration. It is desirable to seek novel self-healing materials for structures in space environments. This includes materials that protect satellite components and systems from radiation.

Impact: Self-healing materials can assist shielding if it is subject to damage or degradation, especially non-metal components, and can be useful in many types of satellite structures. Depending on the payload and mission requirements, a satellite may be required to operate for lifetimes of many years (i.e., some satellites are expected to last more than 7 years). Satellites must be self-sufficient during these long periods.

Although extreme solar events that may severely impact satellite constellations are rare, protection to satellites provided by self-healing materials may be a valuable complement to radiation hardening of electronic materials and components, as well as to the health in general of critical satellite systems including solar power subsystems. Self-healing materials also provide additional robustness against nuclear detonations in space. Organic materials may be especially damaged by total radiation dose exceeding 100 krads.

Objective: The objective is to identify novel self-healing materials that assist shielding of electronics or solar arrays from intense radiation. Such materials may also assist other satellite structures from long term degradation.

Research concentration areas include, but are not limited to:

- Identify novel self-healing materials that may assist in satellite protection, especially shielding of electronics and power system materials or components, and explore their material properties in a space environment, especially against damaging effects of solar energetic protons (i.e., much greater than 1 MeV).
- Identify novel self-healing materials that may assist in satellite protection, especially shielding of electronics and power system materials or components, and explore their material properties in a space environment, especially against damaging effects of nuclear detonation X-rays or beta particles (at least 100x typical LEO fluxes).

Average Award Amounts for Topic E:

- Single Investigator Awards will average approximately $150,000 per year.

- Single Grant/Multiple Investigator Awards will average approximately $350,000 per year.

Topic Per4-F: Novel Materials for Unattended Sensing to Support Future Treaties (Thrust 5)

Background: Current uses of unattended monitoring systems include installation of sensors in nuclear facilities to act on a continuous basis to assist in safeguards. Other uses of unattended sensors may include distributed sensor networks in the field to detect Chemical, Biological, Radiological, or Nuclear (CBRN) materials. Evidence of tampering, or conversely assurance that there has been no tampering, is critical to establishing the reliance which may be put upon data from such sensors.

Nanotechnology and related research areas offer new opportunities to control matter on an ultrafine scale. This enables the creation of unique "fingerprints" that may be recorded and checked. Processes that occur at a predictable rate allow the evolution of "fingerprints" to expected values or properties to be forecast and examined. Nanoscience may also enable improved understanding of energy storage or transfer processes that can be exploited for indicators of the status of a material, and to identify specific external forces influencing the structure and energy state of a material. The creation of such novel materials and understanding of their properties will enable future concepts to improve inspections for international agreements.

Impact: Materials with built-in sensing properties can support future treaties that address Weapons of Mass Destruction (WMD), materials, or facilities that could be used to produce WMD. Sensing material may, for example, be applied to facilities, systems, or locks as indicators of their integrity between inspections. These novel sensing materials can help provide unique assurance against tampering to assist verification. This may enable greater reductions in arms and improved confidence in treaties.

Objective: The primary objective of the research sought in this topic is to identify microscale or nanoscale structures and phenomena in materials that can provide passive or active indicators of interference with unattended monitoring or sensing, to support compliance with treaties.

Research concentration areas include, but are not limited to:

- Properties of unique micro/nanostructures that sense and store memories of the type, magnitude and time history of forces that change the structure; for example, changes in the state of materials on the molecular level that provide passive indication of external manipulation, such as unique changes in molecular structure, material color, release of specific molecular indicators that identify changes, or other indicators of change.
- Investigation of active phenomena that identify the state and history of unique micro/nano/molecular structures. This active approach may involve processes that store and transduce energy, and which may emit photons or phonons in response to external manipulation; for example,
    - Methods to control molecular storage in caged molecules or nanotubes and subsequent energy generating interactions;
    - Potential energy generating molecular structures that may be activated by external electromagnetic or acoustic waves (i.e., semi-active approaches);

- Novel thin films that may store or generate low energy and provide a history of external effects on the material(s) of the membrane or surrounding structures.

Average Award Amounts for Topic F:
- Single Investigator Awards will average approximately $150,000 per year.
- Single Grant/Multiple Investigator Awards will average approximately $350,000 per year.

Topic Per4-G: **Nanoscale Radiation Indicators (Thrust 5)**

Background: Identification of the presence of radioactive materials is important for both defense and environmental concerns. Current state-of-the-art nanotechnology offers multiple beneficial applications for the warfighter. For example, fullerene-based nanomaterials, quantum dots, nano-fibers, nanotubes, nano-sheets etc., can be functionalized to possess unique properties or characteristics. The nano-structured materials sought to be investigated within this research topic would indicate the presence of nuclear particles or ionizing radiation. Such material interactions would allow us to better observe the presence of low-level ionizing radiation, or sense nuclear material by means other than direct detection of gammas or neutrons (or use of active interrogation techniques).

Impact: Nano-sized materials that emit spectral signatures in the presence of ionizing radiation or nuclear particles when incorporated in other widely used materials or widely used objects, would assist in location and securing radiological (to potentially include detection of sources below 1 curie at distances exceeding 100 meters) or nuclear materials. Such nano indicators could be utilized to find special nuclear materials, and other radioactive materials that could be used in a radiological dispersal device (RDD). The incorporation of identified nano-sized radiation indicators into other widely used materials such as paint, aluminum or other metal foils, popular corrosion-resistant coatings, etc., which would ensure the wide and popular use of the nano-sized radiation indicators. Further, if the indicators are environmentally benign, they could be spread over wide areas where nuclear material is suspected, to identify specific locations.

Objective: This primary objective of the research sought in this topic is to identify nanomaterials (including micro-scale materials with feature sizes of 2 microns or below into the nano scale) that can be incorporated in to or dispersed in multiple environments (i.e., these are not electronic devices) to sense beta particles, gamma rays, or neutrons. The materials should be robust and nonreactive in extreme field environments that may include continuous exposure to sunlight and temperatures from 223K up to 473K.
Research concentration areas include, but are not limited to:
- Nanomaterials that respond to or interact with beta particles, gamma rays, or neutrons to result in luminescence or phosphorescence or emit radiation at particular wavelengths or bands in the ultraviolet, far infrared, or THz regions.
- Nanomaterials that respond to or interact with beta particles, gamma rays, or neutrons to result in acoustic signal generation.
- Nanoparticle agglomeration phenomenon should be addressed.

Average Award Amounts for Topic G:

- Single Investigator Awards will average approximately $150,000 per year.

- Single Grant/Multiple Investigator Awards will average approximately $350,000 per year.

Topic Per4-H: **Improved Surface and Interfacial Analytical Methods for Chemical and Biological Detection (Thrust 3)**

Background: This topic is in support of the DoD Chemical Biological Defense Program (CBDP). Significant advances have been made in analytical and spectroscopic methods, chemical synthesis, and materials science relevant to detection of analytes of interest to the chemical and biological (CB) defense community. This topic aims to ultimately advance analytical methods utilizing characteristic signatures of CB analytes, for both improved screening of classes of compounds and for improved sensitivity and/or selectivity in identifying particular analytes. Many current and proposed detection concepts include interaction of the analytes of interest with molecular recognition elements (e.g., receptors, catalysts, enzymes) at a surface or interface.

Impact: Improved understanding of the physics and chemistry of CB analytes at surfaces and interfaces will allow for more sensitive, selective, and quantitative recognition of molecular or interaction signatures. The long-term potential applications of this knowledge include enhancement of current capabilities in CB threat analyte screening, detection, protection, and decontamination. Furthermore, improvements in the sensitivity and selectivity of surface-sensitive analytical and spectroscopic techniques should advance the state-of-the-art in the reproducible design and use of novel nanostructured materials for CB defense applications.

Objective: The specific focus of this topic is improved fundamental understanding of physical and chemical phenomenology at surfaces and interfaces relevant to CB detection, as well as improved analytical methods specific to this interfacial regime. Research areas of interest are as follows:

- Significant advances in ultrasensitive analytical or spectroscopic approaches for improved quantitative chemical analysis at interfaces or membranes, and/or for improved fundamental understanding and recognition of molecular adsorption onto surfaces critical to sensor architectures;
- Fundamental investigations of equilibria, reaction kinetics, catalytic activity, thermodynamics, adsorption, or plasmonic phenomena/enhancements at surfaces or interfaces relevant to CB analyte detection or recognition.

Priority will be given to proposals that couple experimental observation with theoretical grounding and prediction, rather than purely computational or purely experimental approaches. The goal of this topic is improved understanding of the physical and chemical phenomenology at the surface or interface that could be exploited for improved detection of CB analytes. Proof-of-concept experimentation is expected; however, proposals offering the development of devices (e.g., sensors) will not be entertained.

Average Award Amounts for this CBDP Topic H:
- Single Investigator Awards will average approximately $250,000 per year.
- Single Grant/Multiple Investigator Awards will average approximately $500,000 per year.

Topic Per4-I: **Identification and characterization of bacterial metabolic enzymes and**

pathways (Thrust 3)

Background: While greater attention has been given to understanding the molecular mechanisms of pathogenesis of the bacterial threat agents, the physiological processes needed for the colonization, growth, and persistence of these organisms remains relatively uncharacterized. As a result, antimicrobial intervention remains limited to those processes currently targeted by existing classes of antibiotics.

Impact: The identification and characterization of bacterial metabolic enzymes will provide data essential for novel antimicrobial development. These data will lay the foundation for a target based drug discovery program that will maintain the development pipeline for medical countermeasures of interest to the CBDP.

Objective: This research task area will address the identification and characterization of proteins which are required for metabolic processes essential for host pathogenesis and infection. Experimental approaches should identify and validate antimicrobial targets, determine the biochemical properties of physiological enzymes to inform the development of high-throughput screening assays needed for drug development, and determining protein structures of enzymes needed for pathogenesis to aid in target based drug design. While this research will provide a greater understanding of the molecular mechanisms of bacterial: host interactions, the ultimate goal is to identify novel antimicrobial targets. Proposals for this topic will be limited to work involving the following organisms: Bacillus anthracis, Yersinia pestis, Francisella tularensis, Burkholderia pseudomallei, and Burkholderia mallei. Research should include aspects of the following:

- Screening for mutants defective in predicted metabolic processes which attenuate pathogenesis in model systems.
- Characterization of metabolic pathways implicated in virulence and validation of their role in bacterial pathogenesis in multiple model systems.
- Crystallography of bacterial metabolic or biosynthetic enzymes experimentally validated as required for infection.
- Biochemical analysis of bacterial metabolic or biosynthetic enzymes required for infection.

Average Award Amounts for Topic I:

- Single Investigator Awards will average approximately $250,000 per year.
- Single Grant/Multiple Investigator Awards will average approximately $500,000 per year.

Topic Per4-J: Mechanisms of virulence changes during in vivo passage of viral pathogens (Thrust 3)

Background: It is becoming increasingly common knowledge that in vivo passage of microbial pathogens can often result in that pathogen becoming more virulent. For example, serial passage of Salmonella typhimurium through mice results in higher levels of fitness within that host species. A strain of HIV-2 became more virulent after only five serial passages through baboon hosts. Given the rapid rate at which viral pathogens are able to evolve, the potential of virulence increases after minimal passaging in vivo is of particular concern. While this phenomenon has been observed in a wide range of microbes, the mechanisms behind these changes remain to be elucidated. It is also unclear whether or not these mechanisms will be specific to the host species in question, or if they are general to a wide range of host species.

Due to safety and security concerns, it is essential that any proposed research deals with non-select, non-human viral agents.

Impact: This topic will support CBDP goals by enhancing our understanding of potential biological threats. While not involving select agents, research in this area will shed light on mechanisms utilized by viruses to enhance virulence, with the specific focus on those mechanisms utilized during serial in vivo passage. A fundamental understanding of these mechanisms may be more broadly applicable to our ability to detect and develop countermeasures against potential bio-threat agents.

Objective: Research under this topic will involve non-select, non-human viral pathogens, and examine the following:

- Mechanisms of virulence changes during in vivo passage.
- Potential identification of general mechanisms that are utilized by multiple viral species.
- Investigations of whether increased virulence due to passage through one host species translates to other host species..

Average Award Amounts for Topic J:

- Single Investigator Awards will average approximately $250,000 per year.
- Single Grant/Multiple Investigator Awards will average approximately $500,000 per year.

Y Topics: Proposals that focus on exploratory aspects of a unique problem, a high risk approach, or innovative research in subjects with potential for high impact to C-WMD science from non-tenured faculty who received a Ph.D. or equivalent degree on or after 15 May 2004. DTRA anticipates that Young Investigator Awards will be $100,000 per year, each with a Period of Performance (POP) of two (2) years.

Per4-Y-1: Charge Collection and Photon Conversion for Radiation Sensing (Thrust 1)

Background: Radiation detection technologies to support the interdiction of nuclear and radiological materials are critical to combating nuclear and radiological terrorism. All current radiation detection systems require either charge collection (for gaseous or semiconductor based systems) or photon conversion (for scintillators) to initiate generation of a current or voltage pulse that leads to a "detectable" signal. For semi-conductor detectors, an ionizing event within the depleted region of the detector generates charge pairs that then migrate to the anode and cathode of the detector. Contacts applied to the detector surface generally serve to apply bias as well as collect the charge that successfully reach the contact. The collected charge is superimposed over the semiconductors noise sources, which tend to reduce resolution and establish a lower bound on detectable signal. Greater understanding of the contact / semiconductor interface may lead to more efficient charge collection and means to reduce thermal and shot noise that in-turn will lead to improved signal-to-noise ratios. For scintillators, it is generally recognized that resolution is limited by the statistical variation in the production of electrons from photons incident on a photon converting surface such as the photo-cathode used in conventional photomultiplier tubes (PMTs). Whereas PMT are inherently low noise, they have other characteristics that are undesirable to include size, cost, and power requirements. Investigation of novel photo-conversion materials and processes that are low noise and

demonstrate high quantum efficiency may lead to devices that achieve much higher sensitivity and energy resolution.

Impact: A better understanding of semiconductor surface electronic and physical structure will provide lower uncertainties in detector performance. Better understanding of both charge collection and light conversion processes may lead to innovation in semiconductor and scintillators systems that all improved energy resolution and decreased noise.

Objective: The objective of this solicitation is to support the understanding of the underlying mechanisms, limitations and potential advancements that can be made in the collection of charge from semi-conductor materials or photon conversion from scintillator materials. The scope includes increasing basic understanding of the surface and contact interface properties of semiconductors that minimize shot and thermal noise and maximize usable signal collection. This encompasses exploration of the electronic structure of semiconductor detector surfaces and contact interfaces to optimize detector signal-to-noise ratio. The scope also includes examining fundamental properties of photon-to-electron conversion processes and the exploration of materials and devices that permit high quantum efficiencies while also reducing noise sources for a range of radio-luminescent materials.

Research areas may include but are not limited to the following areas:

- Fundamental research into charge collection from contacts of semi-conductor materials
- Research in semiconductor detector materials surface physical and electronic structure
- Research in contacting materials to reduce noise generation
- Research in photoelectric conversion processes that achieve high quantum efficiencies for photons over a wide optical range, particularly at wavelengths < 425 nm
- Unconventional means of light conversion that result in measurable signals that preserve energy information

Per4-Y-2: Post-Detonation Radiological and Nuclear Forensics (Thrust 1)

Background: This topic explores ways to enable accurate post-detonation analysis of debris from a radiological or nuclear event on a short time scale. The Department of Defense provides the capability to collect and analyze post detonation debris. DTRA is responsible for research and development that will enable this post-detonation forensics. The current methodology includes a radiochemical assay that requires an inordinately long time to obtain statistically accurate results. The advancement of analytical techniques could lead to the ability to accurately analyze debris on time scale shorter than this current methodology (~ 1 week). Ideally, this topic seeks novel methodologies which are non-destructive, allowing additional confirmation using the identical sample. Furthermore, a need exists to improve the capability of sample collection; to this end this topic seeks novel methods which have the potential of being more robust under a wide variety of adverse conditions. Also of interest are techniques for material reconstruction that may lead to the determination of the radionuclide source activity after an RDD (radiological dispersal device) detonation.

Impact: The development of advanced post detonation forensics addresses DTRA's counter WMD need to enable prevention of future detonations, enable identification of those responsible, and aid in response and recovery efforts. Such research has the potential to lead to a field deployable system with a real time analysis capability.

Objective: This topic explores novel methods and advancements in the ability to collect samples of material, analyze radioactive debris, and identify signatures from debris analysis in a post detonation environment. Specific interests include the investigation of non-destructive analytical techniques and signatures for material reconstruction. Proposals that engage government laboratory (DoD) institutions are also encouraged.

Research areas may include but are not limited to the following areas:

- Novel methods for rapid isotopic identification and measurement after a nuclear or radiological detonation
- Emphasis will be placed on non-destructive analytical techniques
- Emphasis will be placed techniques with the potential to eliminate the need for separative radio-chemistry
- Areas of consideration in this research area may include Nuclear Magnetic Resonance (NMR), Neutron Activation Analysis (NAA), laser spectroscopy, mass spectrometry, and ligand based techniques
- Identification of necessary signatures from debris analysis to enable material reconstruction of radiological dispersal devices
- New methods for sample collection after a nuclear or radiological attack.

Per4-Y-3: Advancing Knowledge of Network Theory for Network Analysis and Response to Attacks (Thrust 2)

Background: In order to preserve essential military capabilities following an attack employing weapons of mass destruction (WMD), one must be able to predict the interdependent responses of the military and national infrastructure networks that define the military capability in response to damage and to changes in network demand that result from such an attack. These include military networks (US and coalition), like the defense strategic communications system, global information grid (GIG) and battlespace networks; non-military networks, the national power grid and transportation grids. Critical considerations in the face of WMD disruption are network availability, interoperability, robustness and recovery. The basic nature of a WMD attack is that multiple nodes will be compromised simultaneously to varying degrees through a multitude of failure mechanisms – some common mode, others implementation-specific, still others as a result of dependencies. The space- and time-correlated details of the damage and the specific nature of the faulty behavior are not known a priori. The WMD stressors to networks can include, for example, widely distributed failures of electronics from nuclear electromagnetic pulse or the long-term denial of network elements or segments due to WMD contamination from NBC material as well as direct physical damage. Many current management approaches and policies of network systems contain static assumptions about the structure of network, and they do not account for time dependent variation in traffic type, significant changes in the number of operating nodes, changing security conditions and changed user demands, including the

potential need to prioritize network traffic. In order to understand the critical vulnerabilities and develop avoidance/recovery strategies of such diverse, yet interdependent networks to WMD attack, a fundamental understanding of the approaches which capture network dynamics is required. This effort is intended to answer questions like: What are the essential elements of any network? How do different implementations impact on interoperability, vulnerability, survivability and recovery of networks in a WMD environment? What is the mix of implementations that optimize these measures? What data would be most valuable to collect from existing networks to supplement/validate the mathematical and statistical models that will be developed under this effort? What are adaptive network policies and optimization methods? What are routing approaches for networks with variable connectivity and information content? What policies are suitable for managing user demand in the event of major attacks?

Impact: This research will advance theoretical understanding and methods necessary to improve network robustness, management and recovery. Understanding the fundamental properties that contribute to the robustness of networks will support system reliability, survivability and security. This research will identify methods to use indirect information (e.g. peacetime performance indicators or network outages from natural events) for determining what data and how much data are needed to adequately understand the impact of WMD stressors on complex networks. This will impact many areas such as sensor networks, telecommunications, and systems of systems. Defense systems and operating procedures will be optimized to ensure the maintenance of capabilities rather than individual systems, reducing acquisition costs and increasing WMD survivability and operability.

Objective: The objective of this effort is to conduct basic research to advance current knowledge of physical, social and techno-social network behavior and to identify optimal responses to large scale/global, network outages that occur almost simultaneously due to a single Weapons of Mass Destruction (WMD) threat event. High value is placed on science-based mathematical and statistical methods to determine intra- and inter-network failure modes and dependencies and methods to increase network robustness to avoid/minimize WMD stressor impacts. The main thrust of this network topic is to extend prior research to be more specific in defining WMD environments and target networks layers.
Some of the research areas may include (but not be limited to):

- Advances in theoretical understanding or mathematical modeling of the properties of complex networks that cannot be described in terms of graphs or methods used for simple networks and analysis of key aspects of topologies that govern network response to WMD stressors.
- Classification and modeling of attacks on communication and other infrastructure networks to define survivability metric accounting for robustness, fragility, reconfigurable and self-healing of the network.
- Advances in inference algorithms capable of identifying damage via targeted and limited tests. Advances in network control and routing strategies to mitigate network damage. The technique should target design of properly balanced distributed and centralized control of the damage.
- Analysis of optimal structure of networks built to withstand very rare but devastating attacks/outages and capable of fast and least centralized recovery.
- Advances in network forensic for detecting and predicting rare malicious activities and distinguishing them from benign activities over the networks.

- Development of stable and effective network management algorithms for real time allocation of network resources with minimum latency, overhead, and complexity.
- Analysis of key aspects and dynamics in socio-technical networks including cross-layer interactions between social networks and underlying physical and communication layers under WMD stressor impacts.

Per4-Y-4: Self-Healing Radiation Shielding Materials (Thrust 3)

Background: Nuclear detonations may damage or degrade electronics through effects such as X-ray exposure, or creation of artificial radiation belts (i.e., energetic beta particles). Aluminum is a commonly used shielding material for spacecraft electronics, and is also commonly used in various other structures in satellites. Other materials may assist in shielding.

In extreme cases, solar events may drive intense particle exposure with energies in excess of 1 MeV to greater than 1 GeV (e.g., a proton flux that is orders of magnitude beyond fluxes normally encountered in Low Earth Orbit, LEO). Interactions between highly energetic charged particles and nuclei in metals, including those used for shielding, may increase some types of radiation.

Biomimetics involves the study of biological principles to discover new approaches to design artificial systems or components. This general approach suggests research into healing methods for man-made systems. In the case of satellite structures, self-healing is a desirable approach to compensate for inaccessibility.

Self-healing materials incorporate the function to repair the material structure (especially for non-metals) in response to damaging effects such as may be caused by ultraviolet exposure, atomic oxygen, or intense radiation. Failures at the microscopic level can be repaired, for example, by materials that release adhesives and catalysts to drive polymerization. Other approaches have been or are under consideration. It is desirable to seek novel self-healing materials for structures in space environments. This includes materials that protect satellite components and systems from radiation.

Impact: Self-healing materials can assist shielding if it is subject to damage or degradation, especially non-metal components, and can be useful in many types of satellite structures. Depending on the payload and mission requirements, a satellite may be required to operate for lifetimes of many years (i.e., some satellites are expected to last more than 7 years). Satellites must be self-sufficient during these long periods.

Although extreme solar events that may severely impact satellite constellations are rare, protection to satellites provided by self-healing materials may be a valuable complement to radiation hardening of electronic materials and components, as well as to the health in general of critical satellite systems including solar power subsystems. Self-healing materials also provide additional robustness against nuclear detonations in space. Organic materials may be especially damaged by total radiation dose exceeding 100 krads.

Objective: The objective is to identify novel self-healing materials that assist shielding of electronics or solar arrays from intense radiation. Such materials may also assist other satellite structures from long term degradation.

Research concentration areas include, but are not limited to:

- Identify novel self-healing materials that may assist in satellite protection, especially shielding of electronics and power system materials or components, and explore their material properties in a space environment, especially against damaging effects of solar energetic protons (i.e., much greater than 1 MeV)
- Identify novel self-healing materials that may assist in satellite protection, especially shielding of electronics and power system materials or components, and explore their material properties in a space environment , especially against damaging effects of nuclear detonation X-rays or beta particles (at least 100x typical LEO fluxes)

Per4-Y-5: Novel Materials for Unattended Sensing to Support Future Treaties (Thrust 5)

Background: Current uses of unattended monitoring systems include installation of sensors in nuclear facilities to act on a continuous basis to assist in safeguards. Other uses of unattended sensors may include distributed sensor networks in the field to detect Chemical, Biological, Radiological, or Nuclear (CBRN) materials. Evidence of tampering, or conversely assurance that there has been no tampering, is critical to establishing the reliance which may be put upon data from such sensors.

Nanotechnology and related research areas offer new opportunities to control matter on an ultrafine scale. This enables the creation of unique "fingerprints" that may be recorded and checked. Processes that occur at a predictable rate allow the evolution of "fingerprints" to expected values or properties to be forecast and examined. Nanoscience may also enable improved understanding of energy storage or transfer processes that can be exploited for indicators of the status of a material, and to identify specific external forces influencing the structure and energy state of a material. The creation of such novel materials and understanding of their properties will enable future concepts to improve inspections for international agreements.

Impact: Materials with built-in sensing properties can support future treaties that address Weapons of Mass Destruction (WMD), materials, or facilities that could be used to produce WMD. Sensing material may, for example, be applied to facilities, systems, or locks as indicators of their integrity between inspections. These novel sensing materials can help provide unique assurance against tampering to assist verification. This may enable greater reductions in arms and improved confidence in treaties.

Objective: The primary objective of the research sought in this topic is to identify microscale or nanoscale structures and phenomena in materials that can provide passive or active indicators of interference with unattended monitoring or sensing, to support compliance with treaties.

Research concentration areas include, but are not limited to:

- Properties of unique micro/nanostructures that sense and store memories of the type, magnitude and time history of forces that change the structure; for example, changes in the state of materials on the molecular level that provide passive indication of external manipulation, such as unique changes in molecular structure, material color, release of

specific molecular indicators that identify changes, or other indicators of change

- Investigation of active phenomena that identify the state and history of unique micro/nano/molecular structures. This active approach may involve processes that store and transduce energy, and which may emit photons or phonons in response to external manipulation; for example,
    - Methods to control molecular storage in caged molecules or nanotubes and subsequent energy generating interactions;
    - Potential energy generating molecular structures that may be activated by external electromagnetic or acoustic waves (i.e., semi-active approaches);
    - Novel thin films that may store or generate low energy and provide a history of external effects on the material(s) of the membrane or surrounding structures.

Per4-Y-6: Nanoscale Radiation Indicators (Thrust 5)

Background: Identification of the presence of radioactive materials is important for both defense and environmental concerns. Current state-of-the-art nanotechnology offers multiple beneficial applications for the warfighter. For example, fullerene-based nanomaterials, quantum dots, nano-fibers, nanotubes, nano-sheets etc., can be functionalized to possess unique properties or characteristics. The nano-structured materials sought to be investigated within this research topic would indicate the presence of nuclear particles or ionizing radiation. Such material interactions would allow us to better observe the presence of low-level ionizing radiation, or sense nuclear material by means other than direct detection of gammas or neutrons (or use of active interrogation techniques).

Impact: Nano-sized materials that emit spectral signatures in the presence of ionizing radiation or nuclear particles when incorporated in other widely used materials or widely used objects, would assist in location and securing radiological (to potentially include detection of sources below 1 curie at distances exceeding 100 meters) or nuclear materials. Such nano indicators could be utilized to find special nuclear materials, and other radioactive materials that could be used in a radiological dispersal device (RDD). The incorporation of identified nano-sized radiation indicators into other widely used materials such as paint, aluminum or other metal foils, popular corrosion-resistant coatings, etc., which would ensure the wide and popular use of the nano-sized radiation indicators. Further, if the indicators are environmentally benign, they could be spread over wide areas where nuclear material is suspected, to identify specific locations.

Objective: This primary objective of the research sought in this topic is to identify nanomaterials (including micro-scale materials with feature sizes of 2 microns or below into the nano scale) that can be incorporated in to or dispersed in multiple environments (i.e., these are not electronic devices) to sense beta particles, gamma rays, or neutrons. The materials should be robust and nonreactive in extreme field environments that may include continuous exposure to sunlight and temperatures from 223K up to 473K.
Research concentration areas include, but are not limited to:

- Nanomaterials that respond to or interact with beta particles, gamma rays, or neutrons to result in luminescence or phosphorescence or emit radiation at particular wavelengths or bands in the ultraviolet, far infrared, or THz regions

- Nanomaterials that respond to or interact with beta particles, gamma rays, or neutrons to result in acoustic signal generation
- Nanoparticle agglomeration phenomenon should be addressed

Per4-Y-7: Reactive, Energetic or Biological Materials for Bio-Agent Defeat (Thrust 4)

Background: DTRA is interested in biological-agent defeat weapons to deny enemy use of WMDs. It is critically important that collateral effects associated with the initiation of such weapons be eliminated or vastly reduced when compared to current technology. Biological agents once airborne over large areas are difficult to destroy. However, the destruction of these harmful agents, while they are still contained in vessels in an enemy warehouse, while difficult, can presumably be more readily achieved. Total and remote destruction of the entire facility/housing together with 100% of the harmful agents within is the ideal goal.

Current methods for the destruction of facilities are the use of energetic materials or explosives contained in weapons. In recent years weapons have been developed that use an explosive fill tailored to accomplish particular tasks, such as a thermobaric explosives designed for use against tunnel targets. Analogously, tailored chemicals or biological materials can be conceived that would destroy and effectively neutralize harmful biological agents.

Chemicals specifically tailored for bio-agent defeat would react to produce chemical products that would continue to act to neutralize harmful bio agents, to mix with any airborne or contained (liquid, wet) bio agent materials without dispersing live bio agent in to the atmosphere or plume. Examples of such tailored chemicals would be materials that react to produce biocidal products such as bleaching compounds, halogens, hypohalites and oxidizers. In addition, heat and UV light are known to neutralize bio agents. Therefore, materials that burn to produce heat or UV radiation, would be considered creative new materials. Finally, biological materials tailored for bio-agent defeat would inhibit or mutate bio-agents such that they would be benign after human ingestion. Any of these approaches could significantly improve the effectiveness of agent defeat and reduce collateral damage.

Impact: This research if successful would provide technology that achieves total destruction of harmful biological agents within storage or production facilities, significantly increasing our ability to fight asymmetric wars while avoiding or greatly reducing the risk of unintended or undesirable collateral effects that would likely occur using currently available agent defeat technology.

Objectives: The objective/s of the research proposed in this topic, may be one or several of the below. A single proposal does not need to address all three of the objectives listed.

- To prepare novel solid reactive, energetic, or biological materials that burn or react or interact to completely destroy/mutate stored (wet, liquid) or aerosolized bio agents. Materials sought would yield an order-of-magnitude or greater increase in the quantity of neutralizing materials compared to conventional reactive systems. Materials that are capable of more-than-stoichiometric (catalytic), or of continuous and persistent (for example, burn over seconds and minutes of time) neutralization are of high interest. Other biological or pathogenic approaches that are non toxic and environmentally friendly, which would inhibit

or mutate bio-agents to neutralize harmful *in vivo* effects would be relevant. Novel methods of approach for synthesis and production of these new materials could include combinatorial chemistry, nano-materials, or methods of self-assembly.

- To measure the effectiveness of the new reactive, energetic or biological materials' against bio-agents, including aerosolized bio agents and wet/gelled or liquid agents using bio-agent simulants such as Bacillus thuringiensisor or Bacillus anthracis spores.
- To understand how bio agents 'die' or mutate as a result of interactions with the chemical products, heat, UV or pathogen. These investigations should provide an understanding of the rate of cell damage, the damage mechanism and the extent of damage (can they be viable again once atmosphere is made benign), not only of bacterial spores but also of viruses.

III. DTRA Basic Research Topic Areas—Period 3. These topics are NOT applicable for Period 4.

Topic	Title	Thrust Area
A	Dual Use Basic Science for Bio Defense Drug Design and Delivery of Novel Therapeutics	3
B	Exploration of High-Gradient Phenomena for Sensing Fissile Materials at Long Range	1
C	Laser Driven Intense X-ray Sources	3
D	Network Adaptability from WMD Disruption and Cascading Failures	2
E	Post-Shock Meso- and Macro-Scale Processes in Reactive Materials	4
F	Science for Survivable Nano-scale Electronics	3
G	Situational Awareness for Effective Counter-WMD Strategies	2
H	The Physics of Artificial Radiation Belt Formation and Decay	3
I	Tunnel Wall Stability in Hard Rock under Dynamic Shock Loading Conditions	4
J	Understanding Impact Survivability of Energetic Composites	4
K	CBWA Interactions with Environmental or Living Matter	3
L	Determinants of Antimicrobial Resistance and Persistence in Bacterial Strains	3
M	Interrogation of Biological Response to Acute Ionizing Radiation Exposure	3
N	Materials Responsive to High Energy Radiation	1,3
O	Mechanisms of Highly Efficient Catalysis	1,3
P	Mechanisms of Molecular Recognition	1,3
Q	New Concepts in Nano-scale Chemical and Biological Sensing	1
R	New Concepts in Spectroscopic Methods for Molecular Recognition	1
S	Predictability of the Stable Planetary Boundary Layer	2,3
T	Signatures of Laboratory-Grown Bio-Agents	1,3

IV. DTRA Basic Research Topic Areas—Period 2. These topics are NOT applicable for Period 4.

Topic	Title	Thrust Area
A	Adversarial Motivation and Intent to Acquire, Proliferate, and Potentially Use WMD	2
B	Biological-Agent Dynamics in Turbulent Reacting Flows	4
C	Nano-sized Thermosensor Materials	1
D	Sensing Fissile Material at Long Rang using Novel Methods	1
Y-1	Advancing Knowledge of Network Theory for Understanding Robustness	2
Y-2	Biological-Agent Dynamics in Turbulent Reacting Flows	4
Y-3	Nano-sized Thermosensor Materials	1
Y-4	Sensing Fissile Materials at Long Range using Nano-Structured Detector Materials	1

V. DTRA Basic Research Topic Areas—Period 1. These topics are NOT applicable for Period 4.

Topic	Title	Thrust Area
A	Advancing Knowledge of Network Theory for Understanding Robustness	3
B	Challenges in Integrating Motivation and Intent Knowledge	2
C	Computational Multi-Physics	3, 4
D	Frontiers in Quantum Science	1, 2
E	High Energy-Density Materials with Fast Energy Release	4
F	Impact-Absorbing Transparent Materials	3
G	Microbial Ore Leaching	3, 4
H	Penetration into Granular Earth Materials	4
I	Sensing Fissile Materials at Long Range	1
J	Terahertz Propagation Phenomena and Signatures in the THz Frequencies	1
K	Unconventional Methods for Sensing Interactions of Radioactive Materials with their Surroundings	1
L	Molecular Recognition and Catalysis	1, 3, 5
M	Nano-Structured Porous Materials	1, 3, 5
N	New Concepts in Nano-scale Chemical and Biological Sensing	1
O	Interactions of Toxic Chemical or Biological Agents with Biological Membranes and Fluids	3
P	Interactions of Toxic Chemical or Biological Warfare Agent with Environmental Substrates	1, 3, 5
Q	Understanding Cognitive and Physiological Effects of Heightened Sensory Input	1, 2, 3

ATTACHMENT 9: NOTICE REGARDING USE OF GRANTS.GOV APPLY

Organizations must register in Grants.gov to be able to submit proposals through the Grants.gov portal. Individual Principal Investigators (PI)/Project Directors (PD) do not register; however the Authorized Organizational Representative (AOR) or Business Point of Contact (BPOC) is required to register and, in some cases, the PI/PD may be an AOR.

If you have not already done so, you, as an organization, are encouraged to register in Grants.gov as a prerequisite to submitting a proposal through Grants.gov APPLY. Your Grants.gov registration is valid for all Federal agencies and is in effect regardless of whether you actually submit a proposal. If you have not previously registered, please note that the registration process can take several weeks and you should register as soon as possible.

The following actions are required as part of the registration process. All of the required actions are listed and described although it is likely that, if you do business with the Federal government on a continuing basis, you already have completed some of the actions, e.g., obtaining a DUNS number or registration in CCR. Detailed information, automated tools, and checklists are available at http://grants.gov/applicants/organization_registration.jsp.

Data Universal Number System (DUNS) Number

Your organization will need a DUNS number. A DUNS number is a unique nine-character identification number provided by the commercial company Dun & Bradstreet (D&B). Before requesting a DUNS number, you should investigate if your organization already has a DUNS number. You should ask your organization's chief financial officer, business office, or authorizing official to provide your organization's DUNS number. You also can determine if your organization has a DUNS number by calling D&B at 1-866-705-5711.

If your organization does not have a DUNS number, an authorized official of the organization should request one. If the organization is located in the United States, the request can be made by calling 1-866-705-5711. It also is possible to request a DUNS number online via web registration. If your organization is located outside of the United States, you can request and register for a DUNS number online via web registration.

Central Contractor Registry (CCR)

Your organization will need to register with CCR before you can submit a grant application through Grants.gov. CCR validates applicant information and electronically shares the secure and encrypted data with Federal agencies' finance offices to facilitate paperless payments through Electronic Funds Transfer (EFT). The CCR will house your organizational information, allowing Grants.gov to use that information to verify your identity.

When your organization registers with the CCR, you will be required to complete the Electronic Business Point of Contact (E-Business POC) (see below) and Marketing Partner ID (MPIN) fields. These are mandatory fields that are required when submitting grant applications through Grants.gov. The E-Business POC will be the sole authority of the organization with the capability to designate or revoke an individual's ability to submit proposals on behalf of the organization through Grants.gov. If you are uncertain of the status of your organization's

registration or who your E-Business POC is, you can search the CCR database (http://www.bpn.gov/ccrinq/scripts/search.asp).

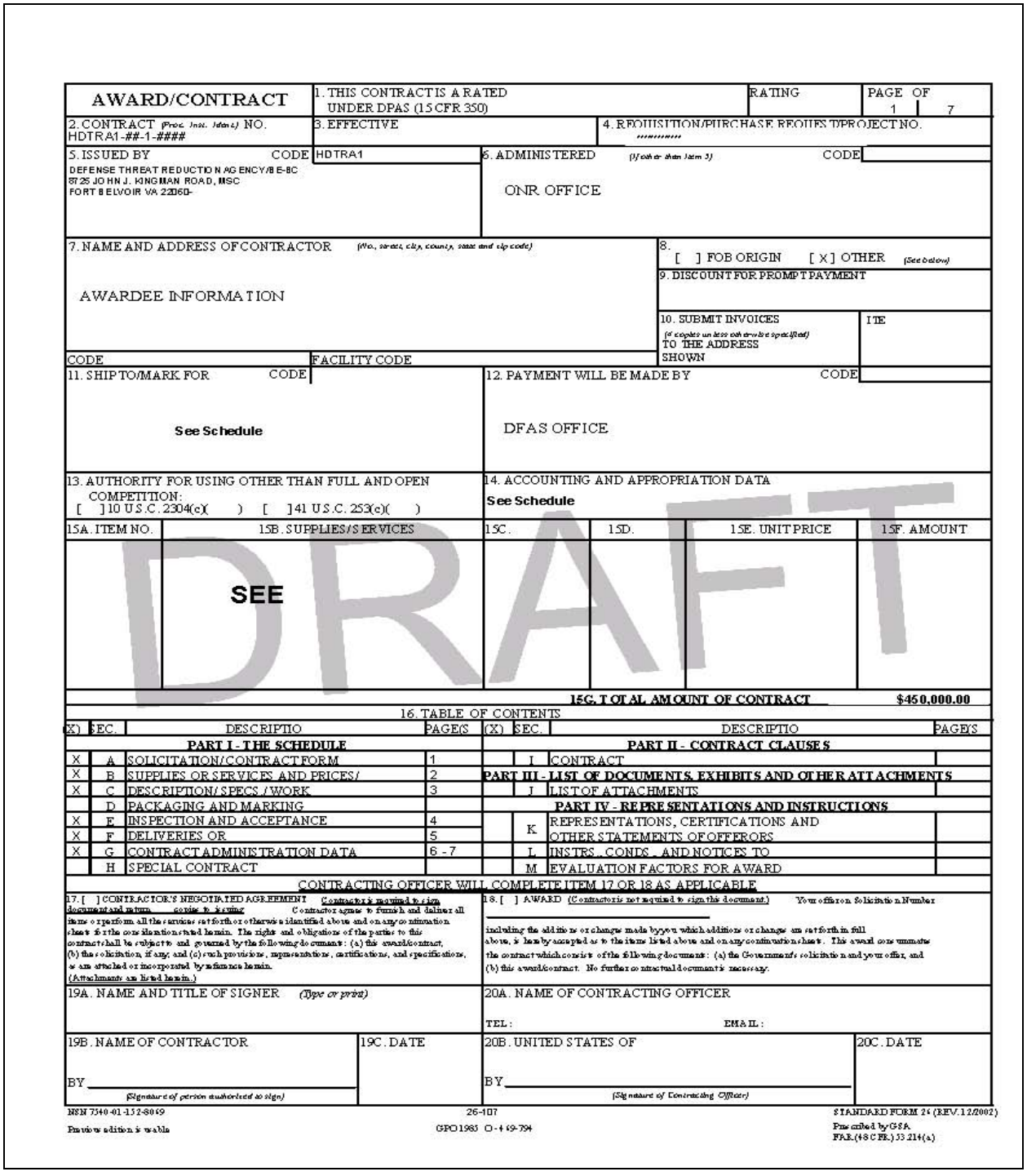
See Section III.3.3 of this BAA for additional information pertaining to registering with CCR.

Authorized Organizational Representative (AOR)

Before submitting a proposal, representatives of your organization need to register to submit on behalf of your organization. Your organization's E-Business POC identified during CCR Registration, must authorize someone to become an AOR. This safeguards your organization from individuals who may attempt to submit Proposals without permission. **Note: In some organizations, a person may serve as both an E-Business POC and an AOR.**

An AOR first registers with the Grants.gov credential provider (at https://apply.grants.gov/OrcRegister) and then with Grants.gov. Once an AOR has completed the Grants.gov process, Grants.gov will notify the E-Business POC for assignment of user privileges. When an E-Business POC approves an AOR, Grants.gov will send the AOR a confirmation e-mail.

ATTACHMENT 10: SAMPLE GRANT WITH DTRA TERMS AND CONDITIONS



AWARD/CONTRACT	1. THIS CONTRACT IS A RATED UNDER DPAS (15 CFR 350)	RATING	PAGE OF 1 | 7
2. CONTRACT (Proc. Inst. Ident.) NO. HDTRA1-##-1-####	3. EFFECTIVE	4. REQUISITION/PURCHASE REQUEST/PROJECT NO. **********	

5. ISSUED BY CODE HDTRA1	6. ADMINISTERED (If other than Item 5) CODE
DEFENSE THREAT REDUCTION AGENCY/BE-BC 8725 JOHN J. KINGMAN ROAD, MSC FORT BELVOIR VA 22060-	ONR OFFICE

7. NAME AND ADDRESS OF CONTRACTOR (No., street, city, county, state and zip code)	8. [ ] FOB ORIGIN [X] OTHER (See below)
AWARDEE INFORMATION	9. DISCOUNT FOR PROMPT PAYMENT
	10. SUBMIT INVOICES (4 copies unless otherwise specified) TO THE ADDRESS SHOWN — ITE
CODE FACILITY CODE	

11. SHIP TO/MARK FOR CODE	12. PAYMENT WILL BE MADE BY CODE
See Schedule	DFAS OFFICE

13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION: [ ] 10 U.S.C. 2304(c)( ) [ ] 41 U.S.C. 253(c)( )	14. ACCOUNTING AND APPROPRIATION DATA See Schedule

15A. ITEM NO.	15B. SUPPLIES/SERVICES	15C.	15D.	15E. UNIT PRICE	15F. AMOUNT
	SEE				

15G. TOTAL AMOUNT OF CONTRACT $450,000.00

16. TABLE OF CONTENTS

(X)	SEC.	DESCRIPTION	PAGE(S)	(X)	SEC.	DESCRIPTION	PAGE(S)
		PART I - THE SCHEDULE				**PART II - CONTRACT CLAUSES**	
X	A	SOLICITATION/CONTRACT FORM	1		I	CONTRACT	
X	B	SUPPLIES OR SERVICES AND PRICES/	2			**PART III - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACHMENTS**	
X	C	DESCRIPTION/SPECS./WORK	3		J	LIST OF ATTACHMENTS	
	D	PACKAGING AND MARKING				**PART IV - REPRESENTATIONS AND INSTRUCTIONS**	
X	E	INSPECTION AND ACCEPTANCE	4		K	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS	
X	F	DELIVERIES OR	5		L	INSTRS., CONDS., AND NOTICES TO	
X	G	CONTRACT ADMINISTRATION DATA	6 - 7		M	EVALUATION FACTORS FOR AWARD	
	H	SPECIAL CONTRACT					

CONTRACTING OFFICER WILL COMPLETE ITEM 17 OR 18 AS APPLICABLE

17. [ ] CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return ___ copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (Attachments are listed herein.)	18. [ ] AWARD (Contractor is not required to sign this document.) Your offer on Solicitation Number _____ including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the items listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your offer, and (b) this award/contract. No further contractual document is necessary.
19A. NAME AND TITLE OF SIGNER (Type or print)	20A. NAME OF CONTRACTING OFFICER TEL: EMAIL:
19B. NAME OF CONTRACTOR BY _____ (Signature of person authorized to sign)	19C. DATE
	20B. UNITED STATES OF BY _____ (Signature of Contracting Officer)
	20C. DATE

NSN 7540-01-152-8069 — 26-107 — STANDARD FORM 26 (REV. 12/2002)

Previous edition is usable — GPO 1983 O-469-794 — Prescribed by GSA FAR (48 CFR) 53.214(a)

Section B - Supplies or Services and Prices

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001		1	Lump Sum	$450,000.00	$450,000.00
	PROPOSAL NUMBER FFP PROPOSAL TITLE				
	In accordance with the following attachments: SOW at Exhibit A, Budget at Exhibit B, and DTRA Terms and Conditions for Grant Awards to Educational Institutions and Other Nonprofit Organizations (WAWF Version) dated JUNE 2009 at Exhibit C. FOB: Destination				
				NET AMT	$450,000.00

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000101					$0.00
	Funding in Support of CLIN 0001 FFP FOB: Destination				
				NET AMT	$0.00
	ACRN AA CIN: 00000000000000000000000000000				$150,000.00

Section C - Descriptions and Specifications

CLAUSES INCORPORATED BY FULL TEXT

252.601-9002 GRANT REFERENCE INFORMATION (MAY 2009)

a. This grant is awarded as a result of Broad Agency Announcement (BAA) **HDTRA1-08-10-BRCWMD-BAA**, Research and Development Enterprise, Basic and Applied Sciences Directorate, Basic Research for Combating Weapons of Mass Destruction (C-WMD).

b. **CFDA #:** 12.351

c. **Authority:** 10 U.S.C. 2358 as amended

Section E - Inspection and Acceptance

INSPECTION AND ACCEPTANCE TERMS

Supplies/services will be inspected/accepted at:

CLIN	INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
0001	N/A	N/A	N/A	Government
000101	N/A	N/A	N/A	Government

Section F - Deliveries or Performance

DELIVERY INFORMATION

CLIN	DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	UIC
0001	POP 01-SEP-2009 TO 31-AUG-2012	N/A	N/A FOB: Destination	
000101	N/A	N/A	N/A	N/A

Section G - Contract Administration Data

ACCOUNTING AND APPROPRIATION DATA

AA: ##########
AMOUNT: $150,000.00
CIN ##########: $150,000.00

CLAUSES INCORPORATED BY FULL TEXT

252.601-9000 GRANT POINTS OF CONTACT (MAY 2009)

a. Grant Specialist:
Name: _____
Defense Threat Reduction Agency/BE-BCR
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (703) 767-_____
email address: _____@dtra.mil

b. Grantee Business Office:
Name: _____
Title: _____
Phone: _____
E-mail: _____

c. Grantee Principal Investigator (PI):
Name: _____
Title: _____
Phone: _____
E-mail: _____

252.632-9000 GRANT INVOICE SCHEDULE AND FUNDING PROFILE (MAY 2009)

INVOICE SCHEDULE:		
INVOICE NO.	INVOICE DATE	PAYMENT
1		
2		
3		
4*	Upon receipt and approval of all required closing documents	$_____.00

FUNDING PROFILE:
The amount of $_____ is obligated for work to be performed during the period beginning with grant award and continuing through _____.
Additional incremental funding planned, but not obligated, is:

FY___ $_____
FY___ $_____

The Government's liability is limited to the amount obligated.

*Upon exercise of an option or modification, the final payment of this schedule will be released and new schedule of payments will be established. (If applicable)

Section J- List of Documents, Exhibits and Other Attachments

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Exhibit A	Exhibit A – Statement of Work	4	17-FEB-2009
Exhibit B	Exhibit B – Budget	1	17 FEB-2009
Exhibit C	Exhibit C – Terms and Conditions	18	11-JUN-2009

EXHIBIT A

STATEMENT OF WORK
Proposal Number
SOW Title

(Specific to each Grant)

This is for illustrative purposes only (as an example of what is included in the final Grant).

You MUST follow the instructions in ***Attachment 6*** *of the BAA.*

EXHIBIT B

Budget
Proposal Number

(Specific to each Grant)

This is for illustrative purposes only (as an example of what is included in the final Grant).

You MUST follow the instructions in ***Attachment 5*** *of the BAA.*

EXHIBIT C

Revised 06.11.2009 (v11)

DEFENSE THREAT REDUCTION AGENCY (DTRA)
GENERAL TERMS AND CONDITIONS
FOR GRANT AWARDS TO EDUCATIONAL
INSTITUTIONS AND OTHER NONPROFIT ORGANIZATIONS

WIDE AREA WORKFLOW VERSION

TABLE OF CONTENTS

1. Acceptance of Grant. The recipient is not required to countersign the grant document; however, the recipient agrees to the conditions specified in the Research Grant and the Articles contained herein unless notice of disagreement is furnished to the Grants Officer within fifteen (15) calendar days after the date of the Grants Officer's signature. In case of disagreement, the recipient shall not assess the grant any costs of the research unless and until such disagreement(s) is resolved.

2. Recipient Responsibility.

a. The recipient will bear primary responsibility for the conduct of the research and will exercise judgment towards attaining the stated research objectives within the limits of the grant's terms and conditions.

b. The principal investigator(s) specified in the grant award will be continuously responsible for the conduct of the research project and will be closely involved with the research effort. The principal investigator, operating within the policies of the recipient, is in the best position to determine the means by which the research may be conducted most effectively.

c. The recipient is the responsible authority, without recourse to the DTRA regarding the settlement and satisfaction of all contractual and administrative issues arising out of procurements entered into in support of an award or other agreement.

d. Recipients are responsible for monitoring each project, program, sub award, function or activity supporting the award. Recipients shall monitor sub awards to ensure sub recipients have met the audit requirements as delineated in DoDGARs §32.26.

3. Order of Precedence. This Grant is subject to the laws and regulations of the United States. Any inconsistency or conflict in the terms and conditions specified in this Grant shall be resolved according to the following order of precedence:

(a) The Federal statute authorizing this award, or any other Federal statutes directly affecting performance of this Grant.

(b) Department of Defense Grant and Assistance Regulations (DoDGARs) Part 32, Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals, and Other Non-Profit Organizations, or Part 34, Administrative Requirements for Grants and Agreements with For-Profit Organizations, as appropriate and Appendix A thereto.

(c) Other terms and conditions contained within the Grant and any attached schedules.

(d) These General Terms and Conditions.

4. Administration and Cost Principles. The following documents and attachments thereto, effective the earlier of (i) the start date of this grant or (ii) the date on which the recipient incurs costs to be assessed the grant, are incorporated by reference as part of this grant:

a. OMB Circular A-110 "Uniform Administrative Requirements for Nonprofits, Hospitals, and Higher Education."

b. OMB Circular A-21, "Cost Principles for Educational Institutions."

c. DoD 3210.6-R, "DoD Grant and Agreement Regulations (DoDGARs)."

The above OMB documents may be obtained from:

Executive Office of the President, telephone: (202) 395-3080 or 7250

Office of Management and Budget
725 17th Street, N.W.
Washington, DC 20503

Or http://www.whitehouse.gov/omb/circulars

The DoDGARs may be obtained from:

http://www.dtic.mil/whs/directives/corres/html/321006r.htm

5. **Standards for Financial Management Systems:**

a. Recipient's financial management systems shall provide for the following:

1. Accurate, current and complete disclosure of the financial results of each federally-sponsored project or program in accordance with the reporting requirements set forth in DoDGARs §32.52.

2. Records that identify adequately the source and application of funds for federally sponsored activities. These records shall contain information pertaining to Federal awards, authorizations, obligations, unobligated balances, assets, outlays, income and interest.

3. Effective control over and accountability for all funds, property and other assets. Recipients shall adequately safeguard all such assets and assure they are used solely for authorized purposes.

4. Comparison of outlays with budget amounts for each award.

5. Written procedures to minimize the time elapsing between the transfer of funds to the recipient from the U.S. Treasury and the issuance or redemption of checks, warrants or payments by other means for program purposes by the recipient.

6. Written procedures for determining the reasonableness, allocability and allowability of costs in accordance with the provisions of the applicable Federal cost principles (see DoDGARs §32.27) and the terms and conditions of the award.

7. Accounting records including cost accounting records that are supported by source documentation.

b. Where the Federal Government guarantees or insures the repayment of money borrowed by the recipient, the DTRA, at its discretion, may require adequate bonding and insurance if the bonding and insurance requirements of the recipient are not deemed adequate to protect the interest of the Federal Government.

c. The DTRA may require adequate fidelity bond coverage where the recipient lacks sufficient coverage to protect the Federal Government's interest.

d. Where bonds are required in the situations described above, the bonds shall be obtained from companies holding certificates of authority as acceptable sureties, as prescribed in 31 CFR part 223, "Surety Companies Doing Business with the United States."

6. Amendment of the Grant. The only method by which this grant may be amended is by a formal, written amendment signed by the Grants Officer. No other communications, whether oral or in writing, are valid.

7. Waivers of OMB Circular Prior Approvals and Other Authorizations.

a. All prior approvals required by OMB CircularA-21 and A-110 are waived except for the following:

1. Change in the scope or objectives of the research project, the methodology or experiment when such is stated in the grant as a specific objective.

2. Any request for additional funding.

3. Expenditures for equipment costing $5,000 or more not specifically identified in the budget incorporated as part of the grant.

4. Expenditures for foreign travel not specifically identified in the budget incorporated as part of the grant.

5. A change in principal investigator or project director (PI/PD).

6. The continuation of the research work during the absence for more than three (3) months, or a twenty-five (25) percent reduction in time devoted to the project, by the approved PI/PD.

7. Unless described in the application and funded in the approved awards, the sub award, transfer or contracting out of any work under an award. This provision does not apply to the purchase of supplies, material, equipment or general support services.

b. Prior approval is not required to transfer amounts budgeted for indirect costs to absorb increases in direct costs, or vice versa.

c. Prior approval must be requested to initiate a one-time, no-cost extension.

8. Preaward Costs. The recipient may incur Preaward costs at the recipient's risk in accordance with the DoDGARs §32.25(d)(2)(i). Incurring pre-award costs more than 90 calendar days prior to award requires the prior approval of the DTRA.

9. Unobligated Balances. In the absence of any specific notice to the contrary, the recipient is authorized to carry forward unobligated balances to subsequent funding periods of this grant agreement in accordance with DoDGARs §32.25(d)(2)(ii).

10. Approval of Change in Performance Period. Extensions of performance periods must be based on a request in writing to the Grants Officer and must be received at least thirty (30) calendar days prior to the end of the current performance period.

11. Payments.

a. See **Financial Reporting Requirements** under article 26 of this document. If these financial reporting requirements are not met, payment can not be dispersed.

b. Recipients receiving scheduled payments shall submit requests for payment using Wide Area Workflow (WAWF) at https://wawf.eb.mil/ in accordance with the Invoice Schedule in Section G of the grant. To receive timely payments, a grant voucher should be submitted on or after the invoice dates specified within Section G of the grant. The request shall be submitted to the Office of Naval Research identified in the Research Grant by entering the following routing codes:

I. Pay Office DoDAAC: See Block 12 (Code) on the first page of the grant.
II. Invoice Type: Grant and Cooperative Agreement Voucher
III. Issue By DoDAAC: See Block 5 (Code) on the first page of the grant.
IV. Admin DoDAAC: See Block 6 (Code) on the first page of the grant.
V. Grant Approver: Same as Admin DoDAAC (Leave Ext. blank)

c. Payments will be made by the Defense Finance and Accounting Service (DFAS) office specified in the Research Grant (Block 12).

12. Funding Increments and/or Options. The recipient is advised that the grantor's obligation to provide funding for increments and/or options included in the grant is contingent upon satisfactory performance and the availability of funds. Accordingly, no legal liability on the part of the grantor exists unless or until funds are made available to the grantor and notice of such availability is confirmed in writing to the recipient. Performance of the research must be deemed satisfactory in the judgment of the DTRA Scientific Officer/Technical Monitor. Refer to the Funding Profile in Section G for the additional incremental funding planned, but not currently obligated for the Grant.

13. Cost Sharing. Unless specified otherwise in the Special Terms and Conditions paragraph of the Research Grant, cost sharing, if any, is included in accordance with OMB Circular A-110, and DoDGARs §32.23.

14. Allowable Costs.

a. The allowability of costs incurred by non-profit organizations that may be recipients or sub recipients of awards subject to this part, or contractors under such awards, is determined in accordance with the provisions of OMB Circular A-122, "Cost Principles for Non-Profit Organizations."

b. The allowability of costs incurred by institutions of higher education that may be recipients, sub recipients, or contractors is determined in accordance with the provisions of OMB Circular A-21, "Cost Principles for Educational Institutions."

c. Where a funding period is specified, a recipient may charge to the award only allowable costs resulting from obligations incurred during the funding period and any pre-award costs authorized by DTRA.

15. Program Income.

a. All program income earned during the project period (except proceeds from the sale of real and personal property and license fees and royalties received as a result of copyrights or patents produced under the grant) shall be retained by the recipient and, deducted from the total project's allowable costs in determining the net allowable costs on which the Federal share of costs will be based.

b. Unless program regulations or the terms and conditions of the award provide otherwise, recipients shall have no obligation to the Federal Government regarding program income earned after the end of the project period.

c. Costs incident to the generation of program income may be deducted from gross income to determine program income, provided these costs have not been charged to the award. (See DoDGARs §32.24).

16. Interest Earned. Interest earned will be subject to guidelines as specified in DoDGARs §32.22

17. Debt Collection. The establishment of debts owed by recipients of grants and transferring them to payment offices for collection shall be dealt with in accordance with DoDGARs §22.820.

18. Audits. Recipients are to periodically have independent, financial and compliance audits subject to DoDGARs §32.26.

19. Subawards. Recipients shall flow down requirements to subawards in accordance with DoDGARs §32.5.

20. Procurement Standards. Recipients shall comply with the standards set forth in DoDGARs §32.40 through .49 and applicable Federal statutes and Executive Orders when expending Federal funds for supplies, equipment, real property, and expendable property. Upon request, recipients shall make available for the DTRA's pre-award review, procurement documents such as requests for proposals or invitations for bids, independent cost estimates, etc. in accordance with DoDGARs §32.44 (e).

21. Title to Expendable and Nonexpendable Property. Unless specified otherwise in the Special Terms and Conditions paragraph of the Research Grant, title to all expendable and nonexpendable tangible personal property purchased with grant funds shall be vested in the recipient after acquisition without further obligation to the government to enhance the university infrastructure for future performance of defense research and related, science and engineering education. The DTRA shall not reserve the right to transfer title. Such property is considered exempt property and subject to the conditions established in OMB Circular A-110 and the DoDGARs §32.33. Recipients are to manage property in accordance with DoDGARs §32.30 through 32.37.

22. Patent Rights. The clause, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," (37 CFR Part 401), is incorporated as part of the grant by reference. Invention reports shall be filed at least annually and at the end of the grant's performance period. Annual reports are due sixty (60) days after the anniversary date of the grant and final reports are due ninety (90) days after the expiration of the final research period. The recipient shall use DD Form 882, Report of Inventions and Subcontracts, to file the invention reports. Negative reports are required. The grant shall not be closed out until all invention reporting requirements are met.

23. Rights in Technical Data and Computer Software. Rights in technical data and computer software under this grant shall be as described in the DoDGARs §32.36.

24. Publication and Acknowledgment. Publication, acknowledgement and disclosure of federal funding under this grant shall be as described in the DoDGARs §32.36.

25. Technical Reporting Requirements. Except under rare cases, performance reports are required annually. Check the award agreement to determine the frequency of reports.

A) **PROGRESS REPORTS:** Progress reports will be due no later than 1 Sep of each year. Grants effective after 31 Jul will not require a progress report until 1 Sep of the following year. Submit an original and two reproducible copies to the Grants Officer's Representative(GOR). It is requested you submit a copy of the progress report via diskette to the GOR. The progress report shall contain the following items:

i) Cover Sheet: As a minimum, the cover sheet should include the following information: Principal Investigator's name, Institution's name and address, and grant number.

ii) Objectives: List the objectives of the research effort or the statement of work: This may be omitted if there has been no change. State new or revised objectives if they have changed and the reason why.

iii) Status of effort: A brief statement of progress towards achieving the research objectives. (Limit to 200 words).

iv) Accomplishments/New Findings: Describe research highlights, their significance to the field, their relationship to the original goals, their relevance to the DTRA mission, and their potential applications to DTRA and civilian technology challenges.

v) Personnel Supported: List professional personnel (Faculty, Post-Docs, Graduate Students, etc.) supported by and/or associated with the research effort.

vi) Publications: List peer-reviewed publications and theses submitted and/or accepted during the 12-month period starting the previous 1 October (or since start for new grants).

vii) Interactions/Transitions:
   a) Participation/presentations at meetings, conferences, seminars, etc.
   b) Consultative and advisory functions to other laboratories and agencies and other DoD laboratories. Provide factual information about the subject matter, institutions, locations, dates, and name(s) of principal individuals involved.
   c) Transitions. Describe cases where knowledge resulting from your effort is used, or will be used, in a technology application. Transitions can be to entities in the DoD, other federal agencies, or industry. Briefly list the enabling research, the laboratory or company, and an individual in that organization who made use of your research.

viii) New discoveries, inventions, or patent disclosures. (If none, report None.)

ix) Honors/Awards: List honors, degrees, and awards received during the grant/contract period. List lifetime achievement honors such as Nobel prize, honorary doctorates, and society fellowships prior to this effort.

x) A quad chart using the following format:

Title of Project, Submitting Principle Investigator, Organization, Grant Number	
Description of Effort: Clear, concise (2-3 Sentences) description of the objectives and methodologies of the effort (Arial 14 point) Challenges: A bullet list (2-3) of the primary scientific challenges being addressed (Arial 14 point)	Picture or Graphic that illustrates the research or concept
Status of effort: A brief synopsis (2-3 Sentences) of progress/accomplishments/new findings towards achieving the research objectives. (Arial 14 point) Personnel Supported: numbers and types of professional personnel (Faculty, Post-Docs, Graduate Students, etc.) supported by and/or associated with the research effort. (Arial 14 point) Publications & Meeting: numbers and types (peer-reviewed publications, theses, symposia, etc) in the previous 12 months (Arial 14 Point)	Bullet list of the major goals/milestones by Project year. (Arial 14 point) Funding Profile (Arial 14 point) Year 1 Dates Year 2 Dates Year 3 Dates PI Contact information (name, email, phone) (Arial 14 Point)

xi) Markings: In order to ensure prompt receipt and acceptance, mark the outside of the package clearly to indicate that it is a progress report.

B) **FINAL TECHNICAL REPORTS:** A comprehensive final technical report is required at the end of an effort, due on the date specified in the grant document. The report should be structured substantially as follows:

i) The purpose of the final report is to document and to transition the results of the effort into the DTRA and DoD applied research community. The final report will always be sent to the Defense Technical Information Center (DTIC) and unclassified reports will be available to the public through the National Technical Information Service (NTIS).

ii) Content: The final report is more than an extension of previous progress reports. The final report shall be a comprehensive technical summary of the significant work accomplished. The final report, where it is not readily accessible in published form should where applicable:

a) Clearly describe and illustrate the experimental equipment, set up, and procedures;

b) Characterize and tabulate collected/computed data in an appendix; and

c) Sufficiently describe computational codes so they can be reproduced. Include a listing of the code in an appendix if possible and appropriate.

d) When the research effort culminates in the production of one or more student theses or dissertations, in these cases, the most significant advancements and conclusions (equations, figures, relationships, etc.) should be included in an executive summary. The theses or dissertations should be attached as appendices only if they are not readily available. If they are, clearly reference them and how they can be obtained. Also include in the executive summary, cumulative lists of people involved in, and publications stemming from, the research effort. Do not include copies of already submitted or published articles in the final report.

iii) Format: Cover and title page. Standard Form (SF) 298, Report Documentation Page, shall be used. Item 13 of the form should contain a 100 to 200 word abstract summarizing technical progress during the reporting period. Style should be third person singular using past tense. Jargon, special symbols or notations, subscripts, mathematical symbols or foreign alphabet letters are not permitted. The pages should be prepared for acquisition and distribution by DTIC. All pages should be of good quality for copying purposes. No pages should be missing.

iv) Grantees are encouraged to submit reports that are printed/copied double sided on recycled paper that has at least 20% postconsumer material. The format and standard required by your institution for the preparation of theses and dissertations shall be used for the final report. In the absence of any institutional

standards, you may wish to refer to the American National Standards Institute (ANSI) document Z39.18-1987, "Scientific and Technical Reports: Organization, Preparation, and Production," for guidance. The report may be obtained from

American National Standards Institute Incorporated
1430 Broadway
New York NY 10018

v) In order to ensure prompt receipt and acceptance, mark the outside of the package clearly to indicate that it is a final technical report.

vi) Report Submission: The Grantee shall submit a draft copy of the final technical report to the GOR for review and acceptance. This report will be due within 60 days after completion of the research. Once the GOR provides written notification that the marked-up draft final technical report has been accepted, the Grantee shall submit five (5) copies of the final report ready for publication within 30 days of the receipt of the marked-up version of the draft report. The report shall contain all corrections cited by the Government in the marked-up copy. Two copies shall be submitted to DTIC-OCP; 8725 John J Kingman Road, Suite 0944; Fort Belvoir, VA 22060-6218; (703) 767-8023; One copy to DTRA, ATTN: NTRM, 6200 Meade Road Ft. Belvoir, VA 22060-5264; one copy to DTRA, ATTN: BE-BCR, 6200 Meade Road Ft. Belvoir, VA 22060-5264; and one copy to DTRA, ATTN: BE-BLMI, 6200 Meade Road Ft. Belvoir, VA 22060-5264. Provide a copy of the transmittal letter to the Grants Administrative Office (DTRA/BE-BCR). The report shall include the Distribution List provided by the Government with the marked-up version of the draft report. The Distribution List should be formatted to match the rest of the report, placed at the end of the report, and added to the Table of Contents. The number of pages in the Distribution List should be added to the total page count and included in the total number of pages cited in Block 15 of the SF298.

26. Financial Reporting Requirements.

a. The following financial report is required for all grant recipients:

1. Federal Financial Report, SF425. This report is due annually, no later than 90 days after the end of the reporting period. The reporting period shall be from 1 Aug – 31 Jul. First year reports shall have a reporting period of the start date of the grant through 31 Jul. Final reports shall be submitted no later than 90 days after the project or grant period end date.

a. The full Federal Financial Report Instructions may be found on the internet at:

http://www.whitehouse.gov/omb/grants/standard_forms/ffr_instructions.pdf

c. All reports shall be submitted to the Office of Naval Research Office identified in the Research Grant.

d. Copies of these forms (including the SF298 mentioned in 25 above) may be found on the internet at

http://www.whitehouse.gov/omb/grants/grants_forms.html

27. After-the-Award Requirements. Closeout, subsequent adjustments, continuing responsibilities, and collection of amounts due are subject to requirements found in DoDGARs §32.71through 73.

28. Foreign Travel Reporting Requirement. Within thirty (30) days after returning to the United States from foreign travel, the Principal Investigator shall submit an acceptable trip report to the Grants Officer summarizing the highlights of the trip. Reimbursement for travel is contingent upon receipt of an acceptable trip report. If the trip report is not received by the required date, reimbursement will not be authorized.

29. Delegation of Administration Duties. Certain grant administration duties have been delegated to the Office of Naval Research (ONR) identified in the Research Grant. These duties are as follows:

a. Provisionally approve all Requests for Advance or Reimbursement (SF 270).

b. Perform all property administration services except the approval of recipient's requests to purchase equipment with grant funds. Such approvals must be granted by the DTRA Grants Officer.

c. Perform all plant clearance functions.

d. Approve requests for Registration of Scientific and Technical Information Services (DD Form 1540).

e. Obtain the interim (if required) and final financial report(s).

f. Obtain the interim patent report(s).

g. Execute administrative closeout procedures, which includes the following:

1. Obtain the final Report of Inventions and Subcontracts (DD Form 882).

2. Obtain final payment request, if any.

3. Obtain final property report and dispose of purchased property and government furnished equipment (GFE) in accordance with the DoDGARs Part 22, Subpart G.

4. Perform a review of final incurred costs and assist the Grants Officer in resolving exceptions, if any, resulting from questioned costs.

5. Assure that all refunds due the Government are received by the grantor.

NOTE: This term and condition is **not applicable** to instrumentation and equipment grant awards.

30. Claims, Disputes and Appeals. Claims, disputes, and appeals shall be processed in accordance with the procedures in DoDGARs §22.815.

31. Debarment and Suspension. The DTRA and grant recipients shall comply with DoDGARs Part 25 which restricts sub awards and contracts with certain parties that are debarred, suspended or otherwise excluded from or ineligible for participation in Federal assistance programs or activities.

32. Termination and Enforcement. Recipients shall be subject to the termination and enforcement conditions found in DoDGARs §32.61 and §32.62.

33. Security. As a general rule, principal investigators will not need access to classified security information in the conduct of research supported under this grant. Should it appear that access to such information is desirable, the recipient shall advise the grantor and request clearance for the investigator. Should information be developed under the course of work under this grant that, in the judgment of the principal investigator or the recipient, should be classified, the Grants Officer shall be notified immediately.

34. Representations and Assurances. By accepting funds under this grant, the recipient assures that it will comply with applicable provisions of the following national policies:

a. National policies prohibiting discrimination:

1. On the basis of race, color, or national origin, in Title VI of the Civil Rights Act of 1964 (42 U.S.C. 2000d, et seq.), as implemented by DoD regulations at 32 CFR Part 195.

2. On the basis of sex or blindness, in Title IX of the Education Amendments of 1972 (20 U.S.C. 1681, et seq.).

3. On the basis of age, in the Age Discrimination Act of 1975 (42 U.S.C. 6101, et seq.), as implemented by Department of Health and Human Services regulations at 45 CFR Part 90.

4. On the basis of handicap, in: Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 794), as implemented by Department of Justice regulations at 28 CFR Part 41 and DoD regulations at 32 CFR Part 56 and the Architectural Barriers Act of 1968 (42 U.S.C. 4151, et seq.).

1. For human subjects, the Common Federal Policy for the Protection of Human Subjects, codified by the Department of Health and Human Services at 45 CFR part 46 and implemented by the Department of Defense at 32 CFR part 219.

2. For animals:

(a) Rules on animal acquisition, transport, care, handling, and use in: (i) 9 CFR parts 1-4, Department of Agriculture rules that implement the Laboratory Animal Welfare Act of 1966 (7 U.S.C. 2131-2156); and (ii) the "Guide for the Care and Use of Laboratory Animals," National Institutes of Health Publication No. 86-23.

(b) Prohibitions on the purchase or use of dogs and cats for certain medical training purposes, in Section 8019 (10 U.S.C. 2241 note) of the Department of Defense Appropriations Act, 1991 (Pub. Law 101-511).

(c). Rules of the Departments of Interior (50 CFR parts 10-24) and Commerce (50 CFR parts 217-227) implementing laws and conventions on the taking, possession, transport, purchase, sale, export, or import of wildlife and plants, including the: Endangered Species Act of 1973 (16 U.S.C. 1531-1543); Marine Mammal Protection Act (16 U.S.C. 1361-1384); Lacey Act (18 U.S.C. 42); and Convention on International Trade in Endangered Species of Wild Fauna and Flora.

35. Use of Human Subjects. The recipient shall adhere to DTRA local clause 252.223-9002. The full text of this clause is as follows:

a. 252.223-9002 PROTECTION OF HUMAN SUBJECTS (APR 2005)

All research under this contract involving human subjects must be conducted in accordance with 32 CFR 219, 10 USC 980, and DoDD 3216.2, as well as other applicable federal and state regulations. Contractors must be cognizant of and abide by the additional restrictions and limitations imposed on the DoD regarding research involving human subjects, specifically as regards vulnerable populations (32 CFR 219 modifications to subparts B-D of 45 CFR 46), recruitment of military research subjects (32 CFR 219), and surrogate consent (10 USC 980). Defense Threat Reduction Agency (DTRA) Directive 3216.01 establishes the DTRA Human Subjects Protection Program, sets forth the policies, defines the applicable terms, and delineates the procedures necessary to ensure DTRA compliance with federal and DoD regulations and legislation governing human subject research. The regulations mandate that all DoD activities, components, and agencies protect the rights and welfare of human subjects of study in DoD-supported research, development, test and evaluation, and related activities hereafter referred to as "research". The requirement to comply with the regulations applies to new starts and to continuing research.

The DTRA directive requires that research using human subjects may not begin or continue until the Defense Threat Reduction Agency's Human Research Oversight Board

(HROB) has reviewed and approved the proposed protocol. Contractors and subcontractors are required to submit a valid federal assurance for their organization (institution, laboratory, facility) that has been issued by either DoD or the Department of Health and Human Services, and documentation of review of proposed protocols by the local Institutional Review Board (IRB) to include consent forms for any planned research using human subjects to the DTRA HROB for its review through the contracting officer's representative (if assigned) or the contracting officer. The HROB review is separate from, and in addition to, local IRB review.

Written approval to begin research or subcontract for the use of human subjects under the proposed protocol will be provided in writing from the DTRA HROB, through the contracting officer. A copy of this approval shall be maintained by both the contractor and the government. Any proposed modifications or amendments to the approved protocol or consent forms must be submitted to the local IRB and the DTRA HROB for review and approval. Examples of modifications/amendments to the protocol include but are not limited to:

1) a change of the Principal Investigator
2) changes in duration or intensity of exposure to some stimulus or agent
3) changes in the information requested of volunteers, or changes to the use of specimens or data collected
4) changes in perceived or measured risks or benefits to volunteers that require changes to the study

Research pursuant to such modifications or amendments shall not be initiated without IRB and HROB approval except when necessary to eliminate apparent and immediate hazards to the subject(s).

36. Prohibition on Use of Laboratory Animals. Notwithstanding any other provisions contained in this grant or incorporated by reference herein, the recipient is expressly forbidden to use or subcontract or subgrant for the use of laboratory animals in any manner whatsoever without the express written approval of the Grants Officer.

37. Research Involving Recombinant DNA Molecules. Any recipient performing research involving recombinant DNA molecules and/or organisms and viruses containing recombinant DNA molecules agrees by acceptance of this award to comply with the National Institutes of Health "Guidelines for Research Involving Recombinant DNA Molecules, " July 5, 1994 (59 FR34496) amended August 5, 1994 (59 FR40170) amended April 27, 1995 (60 FR 20726), or such later revision of those guidelines as may be published in the Federal Register.

38. Officials Not to Benefit. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this agreement, or to any benefit arising from it, in accordance with 41 U.S.C. 22.

39. Retention and Access to Records. Retention and access to records pertinent to this award are subject to the requirements of DoDGARs §32.53.

40. Certifications. By accepting funds under this agreement, the recipient acknowledges the following:

a. 32 CFR Part 25 regarding debarment, suspension, and other responsibility matters.

b. 32 CFR Part 26 regarding drug-free workplace requirements.

c. Certification at appendix A to 32 CFR Part 28 regarding lobbying.

41. Data Collection. Data collection activities, if any, performed under this grant are the responsibility of the recipient. Awarding agency support of the project does not constitute approval of the survey design, questionnaire content, or data collection procedures. The recipient shall not represent to respondents that such data are being collected for or in association with the awarding agency without the specific written approval of the cognizant awarding agency official. However, this requirement is not intended to preclude mention of the awarding agency support of the project in response to an inquiry or acknowledgment of such support in any publication of this data.

42. Site Visits. The grantor, through authorized representatives, has the right, at all reasonable times, to make site visits to review project accomplishments and to provide such technical assistance as may be required. The recipient shall provide, and shall require its sub recipients and subcontractors to provide all reasonable facilities and assistance for the safety and convenience of the government representatives in the performance of site visits. All site visits and evaluations shall be performed in a manner that does not unduly interfere with or delay the work.

43. International Air Travel. Travel supported by U.S. Government funds under this agreement shall use U.S.-flag air carriers (air carriers holding certificates under 49 U.S.C. 41102) for international air transportation of people and property to the extent that such service is available, in accordance with the International Air Transportation Fair Competitive Practices Act of 1974 (49 U.S.C. 40118) and the interpretative guidelines issued by the Comptroller General of the United States in the March 31, 1981, amendment to Comptroller General Decision B138942.

44. Cargo Preference. The recipient agrees that it will comply with the Cargo Preference Act of 1954 (46 U.S.C. 1241), as implemented by Department of Transportation regulations at 46 CFR 381.7, which requires that at least 50 percent of equipment, materials or commodities procured or otherwise obtained with U.S. Government funds under this agreement, and which may be transported by ocean vessel, shall be transported on privately owned U.S.-flag commercial vessels, if available.

45. Military Recruiting on Campus. Military recruiting on campus under this award shall be as specified in the DoDGARs §22.520, Military Recruiting and Reserve Officer

Training Corps Program Access to Institutions of Higher Education, which is incorporated by reference.